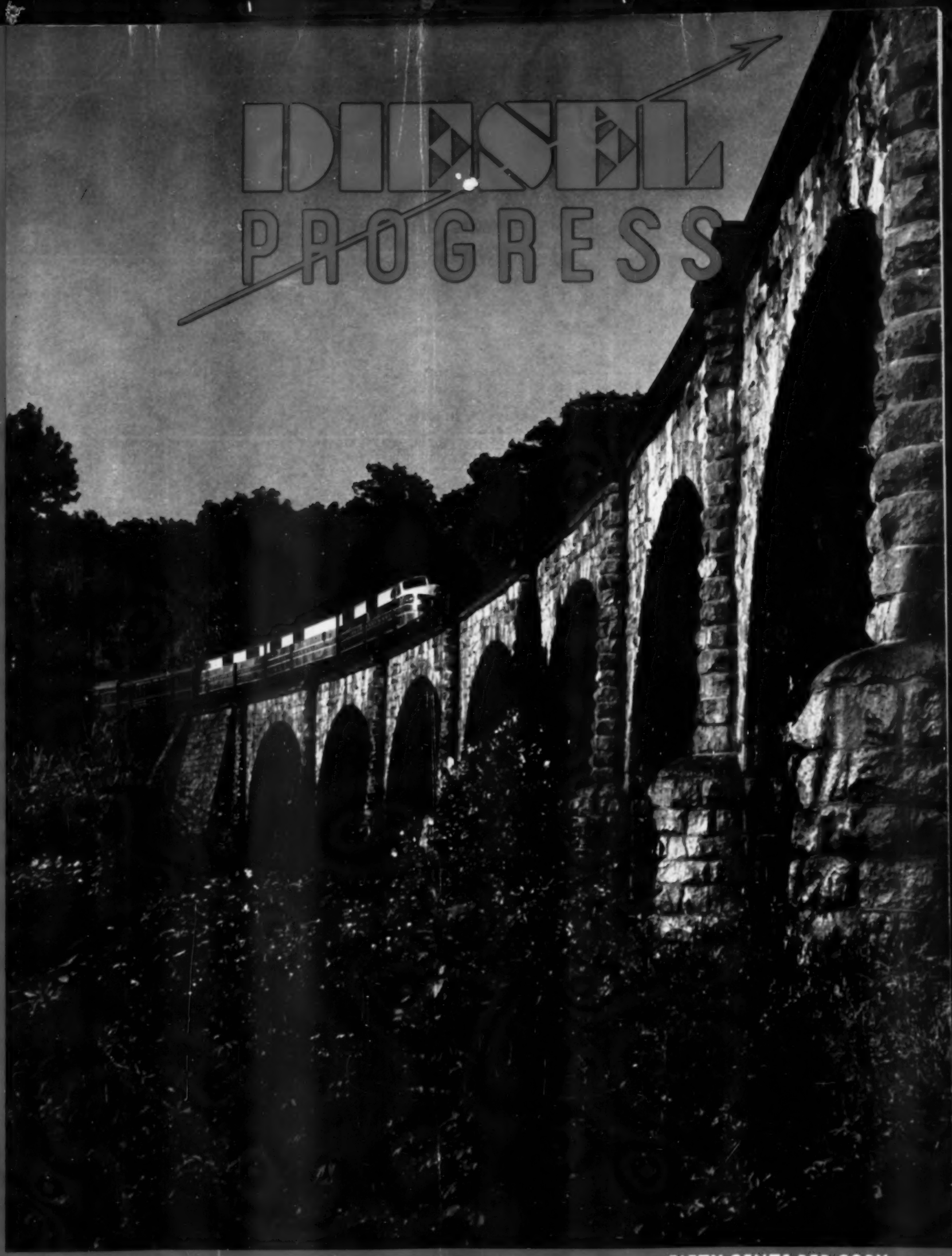
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

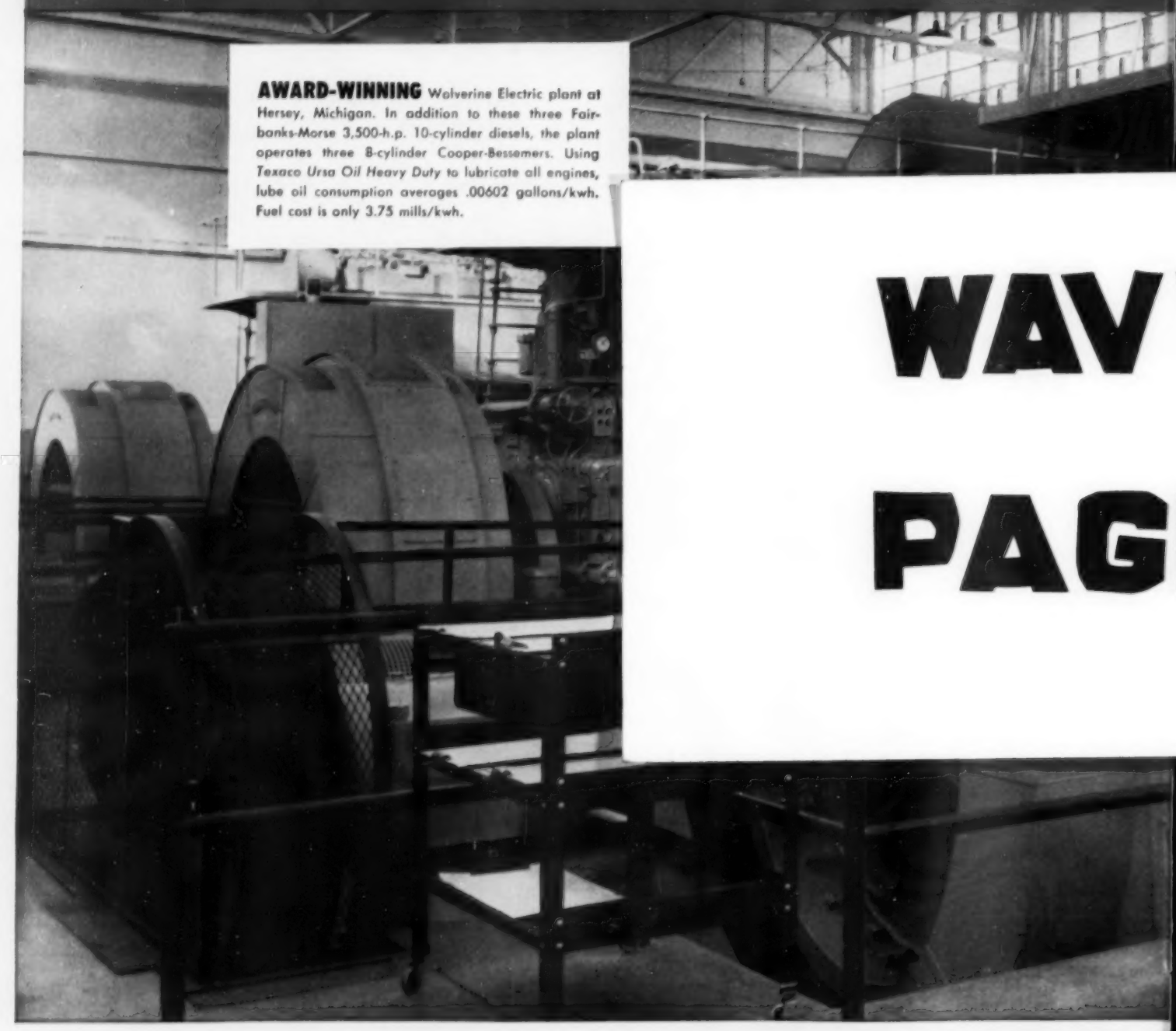


FIVE DOLLARS PER YEAR

FEBRUARY, 1955

FIFTY CENTS PER COPY

100% TEXACO-LUBRICATED PLANT WINS TWO



AWARD-WINNING Wolverine Electric plant at Hersey, Michigan. In addition to these three Fairbanks-Morse 3,500-h.p. 10-cylinder diesels, the plant operates three 8-cylinder Cooper-Bessemers. Using *Texaco Ursa Oil Heavy Duty* to lubricate all engines, lube oil consumption averages .00602 gallons/kwh. Fuel cost is only 3.75 mills/kwh.

WAVY

PAGE

TUNE IN:
TEXACO STAR THEATER
starring JIMMY DURANTE
or DONALD O'CONNOR,
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

TEXACO

WOLVERINE ELECTRIC EFFICIENCY AWARDS

VY

GES

...e Electric Co-operative's Johnson Plant at Hersey, Michigan, has won the coveted Diesel Progress award for efficient operation. An important factor in this success has been effective lubrication —*Texaco*.

All diesels in this Wolverine plant are lubricated with *Texaco Ursa Oil Heavy Duty*. This is one of the famous *Texaco Ursa Oil* series—*a complete line* of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls. These benefits, consistently delivered, explain why—

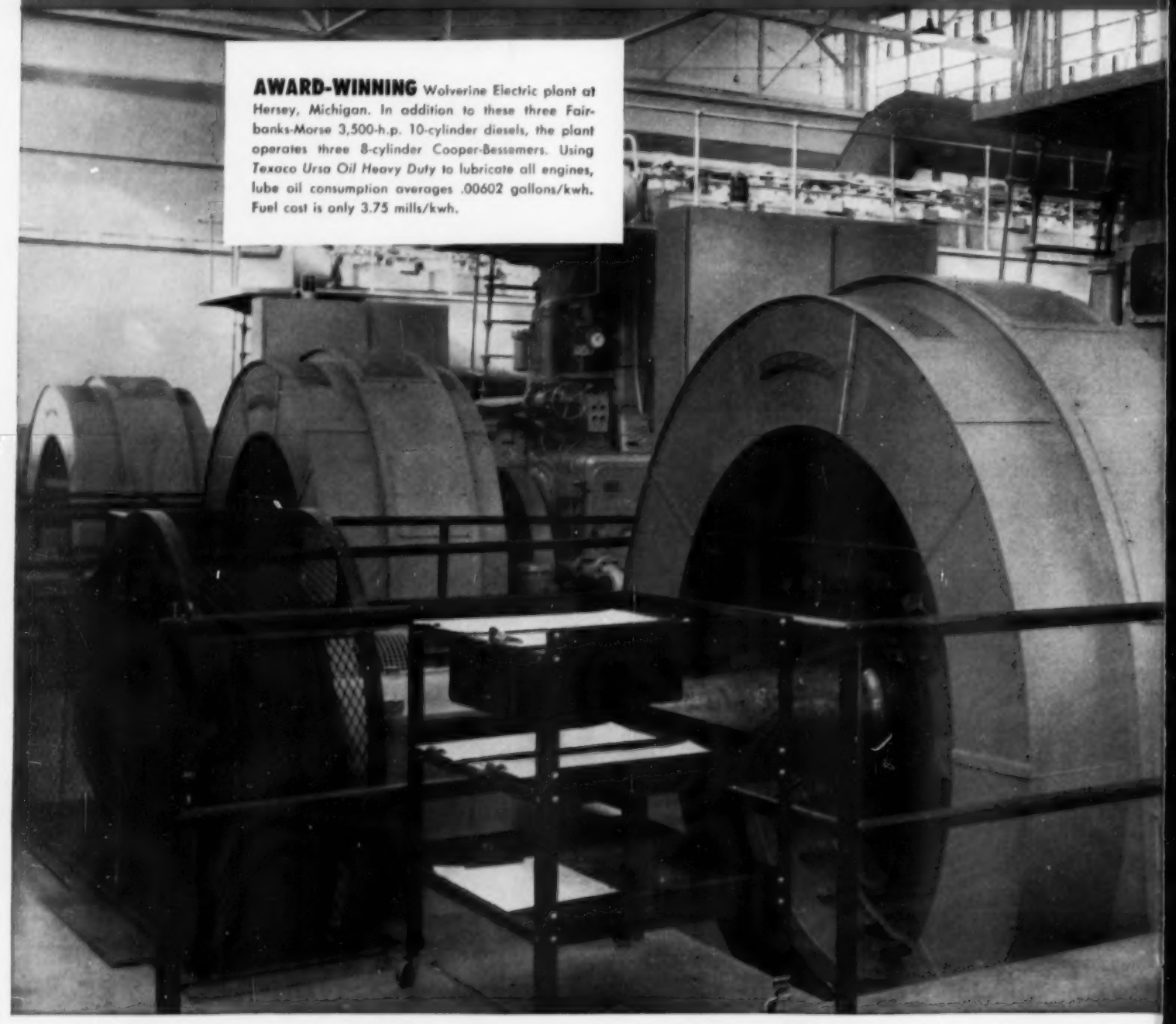
For over 20 years, more stationary diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer help *you* increase efficiency and reduce costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

100% TEXACO-LUBRICATED PLANT WINS TWO



AWARD-WINNING Wolverine Electric plant at Hersey, Michigan. In addition to these three Fairbanks-Morse 3,500-h.p. 10-cylinder diesels, the plant operates three 8-cylinder Cooper-Bessemers. Using *Texaco Ursa Oil Heavy Duty* to lubricate all engines, lube oil consumption averages .00602 gallons/kwh. Fuel cost is only 3.75 mills/kwh.

TUNE IN:
TEXACO STAR THEATER
starring JIMMY DURANTE
or DONALD O'CONNOR,
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

TEXACO

WOLVERINE ELECTRIC EFFICIENCY AWARDS

TWO YEARS in a row, the Wolverine Electric Co-operative's Johnson Plant at Hersey, Michigan, has won the coveted Diesel Progress award for efficient operation. An important factor in this success has been effective lubrication —*Texaco*.

All diesels in this Wolverine plant are lubricated with *Texaco Ursa Oil Heavy Duty*. This is one of the famous *Texaco Ursa Oil* series—*a complete line* of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls. These benefits, consistently delivered, explain why—

For over 20 years, more stationary diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer help *you* increase efficiency and reduce costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

DIESEL and GAS ENGINE PROGRESS

REX W. WADMAN *Editor and Publisher*

IN INDUSTRY · IN TRANSPORTATION · ON THE SEA · IN THE AIR

MARK OGDEN *Executive Editor*
BRUCE WADMAN *Mid-West Editor*
CHAS. F. A. MANN *Associate Editor*
SIDNEY HOFFMAN *News Editor*
MARY N. THOMPSON *Assistant Editor*
PEGGY R. TOMACK *Production Manager*
SYLVIA R. WOLF *Mgr. Reader Service*

CONTENTS FOR FEBRUARY, 1955

EDITORIAL AND PRODUCTION OFFICES

816 N. La Cienega Blvd. Los Angeles 46, Calif.

BUSINESS OFFICES

NEW YORK 20:
W .W. Andrews
604 Fifth Ave.
JUdson 6-4820

CHICAGO 2:
Bruce Wadman
30 N. La Salle St.
Suite 940, Office #1-8
DEarborn 2-3533

LOS ANGELES 46:
Sidney Hoffman
816 N. La Cienega Blvd.
BRadshaw 2-6273

LONDON E.C. 4:
G. L. Fetherstonhaugh
St. Paul's Corner
Ludgate Hill

TULSA 3:
O. F. Cozier
305 Daniel Bldg.
4-5555

CLEVELAND 20:
William W. Andrews
3096 Livingston Road
WYoming 1-7144

MEMBER OF BPA
Business Publications Audit of Circulation, Inc.

DIESEL PROGRESS for February, 1955, Vol. XXI, No. 2. Published Monthly by Diesel Engines, Inc., 816 N. La Cienega Blvd., Los Angeles 46, California. Tel-BRadshaw 2-6273. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £2-12s-6d per year. Acceptance under 34.64, P. L. & R., authorized.

DIESEL PROGRESS is indexed regularly by Engineering Index, Inc.

MEMBER OF MPA
Magazine Publishers Association, Inc.

FRONT COVER ILLUSTRATION

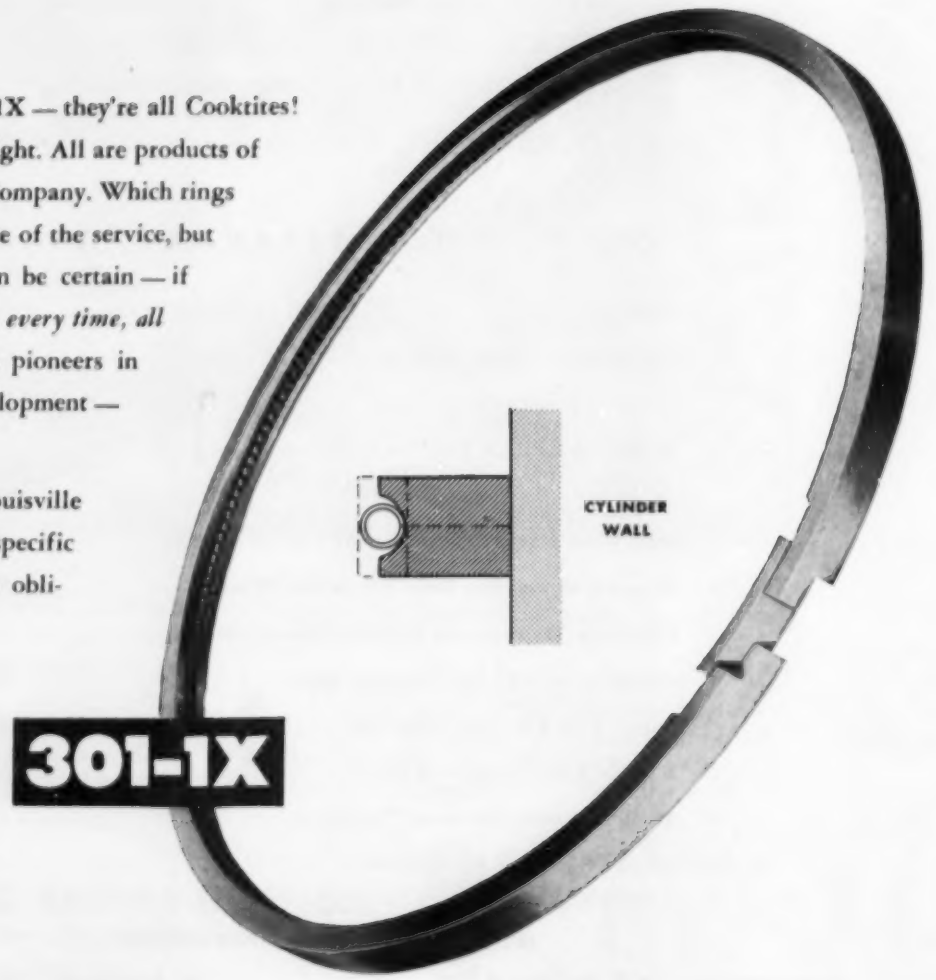
The *Capitol Limited* of the Baltimore & Ohio moves towards Baltimore from its last stop at Washington. It is crossing over the Thomas Viaduct, the world's oldest stone multi-arch railroad bridge at Relay, Maryland.

"COOKTITE"

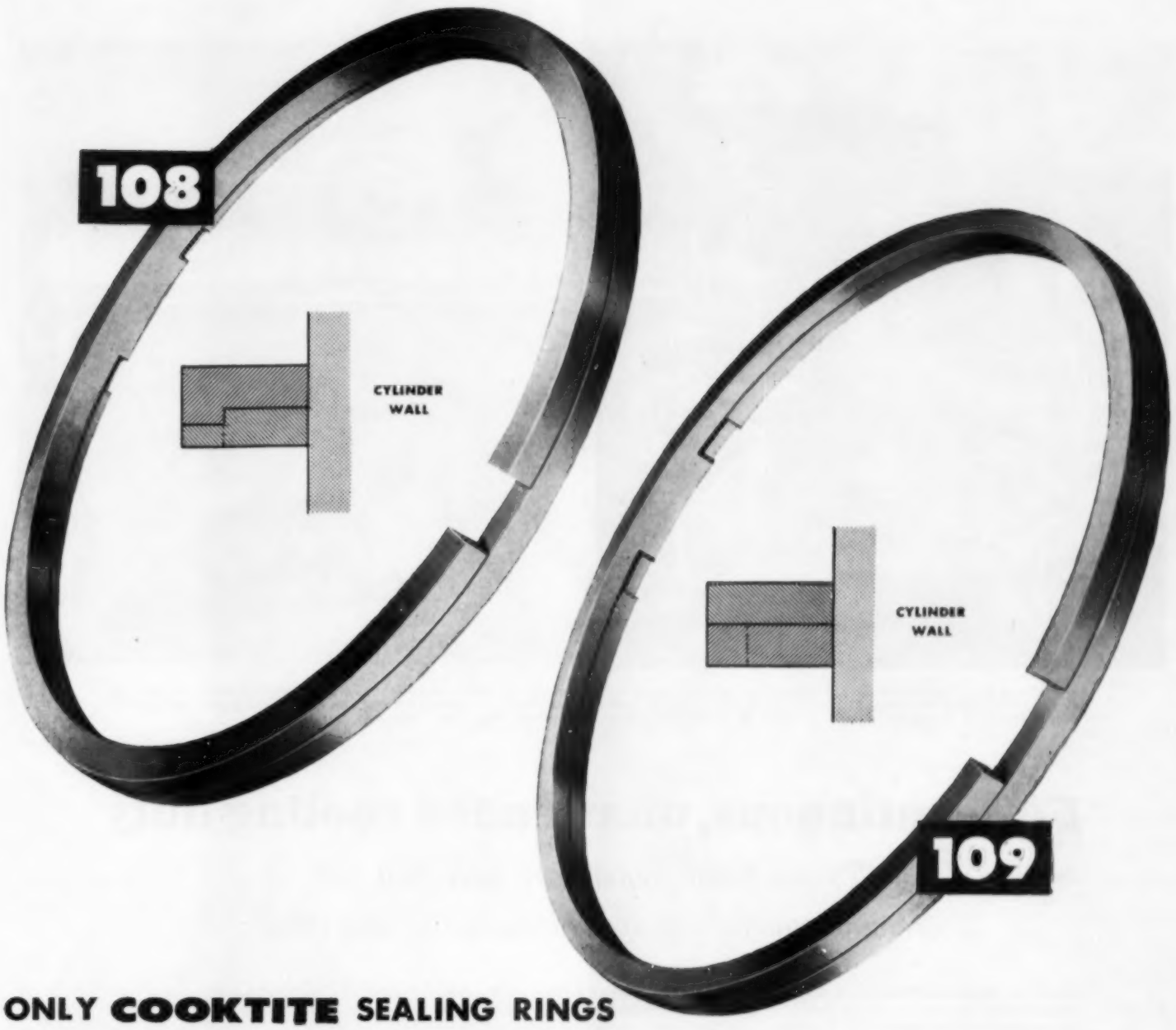
identifies the C. LEE COOK family of Quality Sealing Rings!

TAKE your choice — 108, 109, 301-1X — they're all Cooktites! Each is a great piston ring in its own right. All are products of one manufacturer — the C. Lee Cook Company. Which rings you select will be dictated by the nature of the service, but whatever your choice, of this you can be certain — if it's a Cooktite you'll get a perfect seal *every time, all the time.* That's a promise from the pioneers in industrial piston ring design and development — the C. Lee Cook Company.

Mail the coupon (at right) direct to Louisville for complete engineering data, and specific recommendations for your units. No obligation, of course!



Look to COOK for Better Rings!



ONLY **COOKTITE** SEALING RINGS GIVE YOU ALL THESE ADVANTAGES!

- Insure perfect cylinder seal, thereby preventing blow-by which destroys lubricating oil film!
- Decrease rate of cylinder wear!
- Have special joint construction which eliminates compression leak characteristic of plain rings!
- Restore new engine power and performance to worn cylinders!
- Reduce fuel consumption in tapered cylinders!
- Assure long effective ring life due to superior materials!

C. LEE COOK COMPANY

Sealing Pressures Since 1888

C. Lee Cook Company
952 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

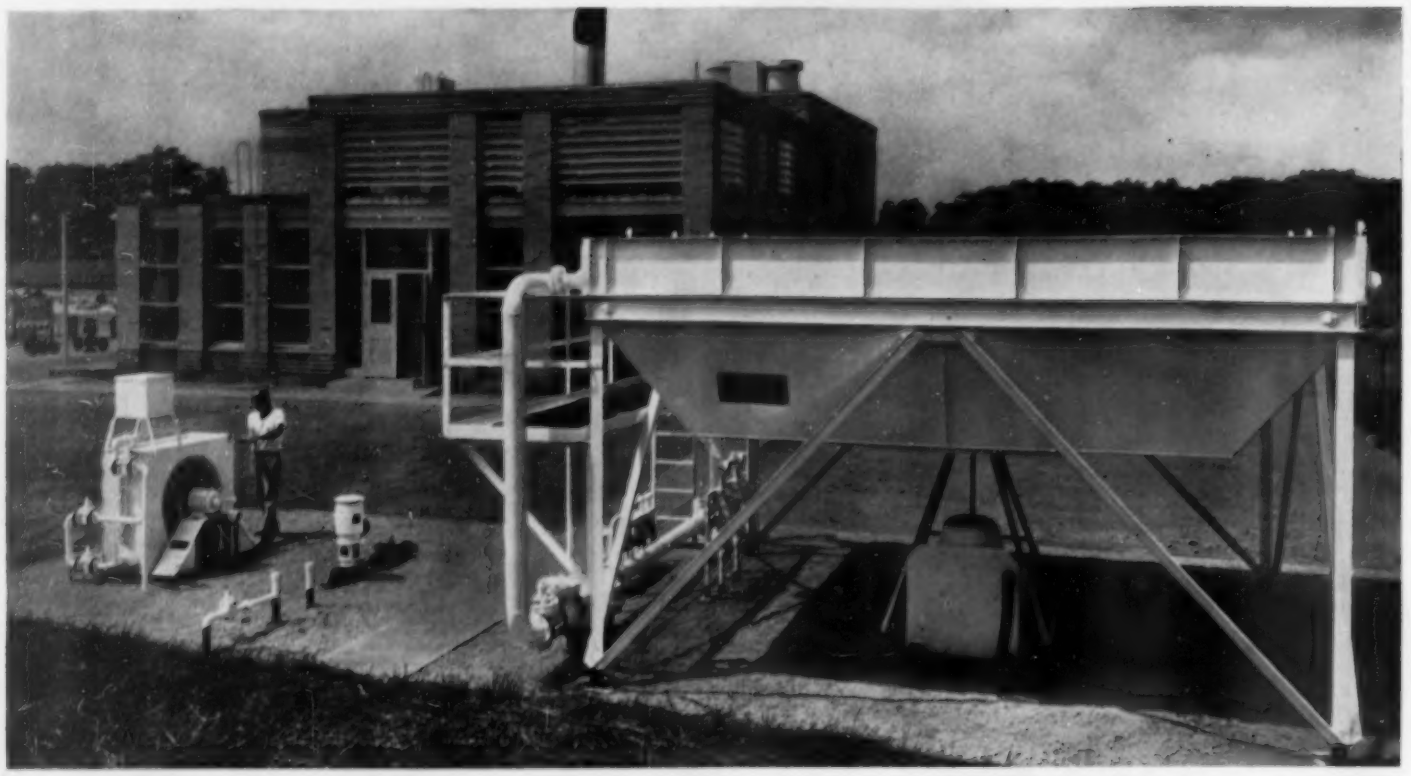
Firm_____

Street_____

City_____ State_____

Attention:_____

Type of Units_____



Two TRANE Fluid Coolers are used at this refined products pumping station at Vicksburg, Michigan. Model EC at left (horizontal air flow) cools hydraulic oil. Model GC at right (verticle air flow) cools jacket coolant, which in turn cools lube oil for Nordberg 2650 hp Diesel. Station is part of a system operated by Shell Oil Company as agent for Wolverine Pipe Line Company.

For continuous, unattended cooling duty

Trane fluid coolers are specified for remote control equipment stations like these

Ability to operate unattended—a major consideration in remote-control pumping stations—is the reason why TRANE Fluid Coolers have been specified for so many modern new pipeline installations. **TRANE Fluid Coolers** are dependable because they are rugged, simply designed, free from maintenance and adjustment problems . . . and these are important "pluses" for *any* cooling job you may have on your boards.

Modulation control is simple, trouble-free. Steel shutters work in unison with a two-speed motor. Complex variable-pitch fan mechanisms are eliminated.

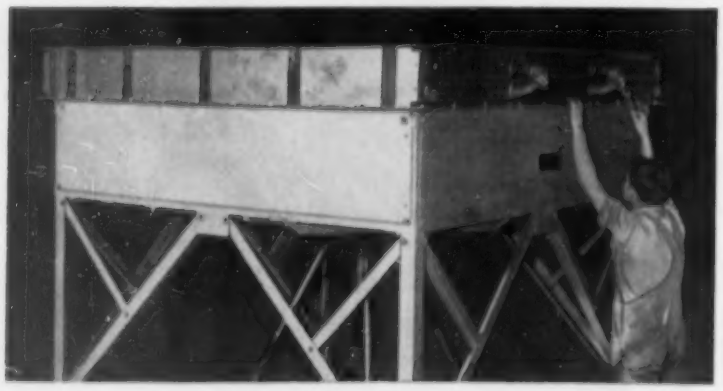
Vibration is isolated by mounting fan and motor independently of the unit.

Greater freeze-up protection. Heavy 14 ga. interlocking steel shutter blades are counterbalanced, powered from both ends to give tight closure, stop all convectional circulation.

Power consumption is cut as much as 65% because two-speed motors operate at half speed up to 80% of the time. *Leaving fluid temperatures* can be held to plus or minus 2°F.

For full information call your nearest TRANE Sales Office, or write TRANE, La Crosse, Wis.

Heart of a fluid cooler is the coil, and TRANE has over 30 years experience in all types of extended surface heat transfer equipment. Because TRANE makes its own coils, the heat transfer performance and horse power consumption of TRANE Fluid Coolers is a known quantity—accurately predictable in advance.



TRANE

MANUFACTURING ENGINEERS

One source, one responsibility for:
Air Conditioning · Heating · Ventilating
Heat Transfer Equipment

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa.
Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 15 Canadian Offices

a coast to coast AUTHORIZED Service Organization

FUEL INJECTION EQUIPMENT

SCINTILLA DIVISION OF

Bendix
AVIATION CORPORATION

SIDNEY, NEW YORK

Export Sales: Bendix International Division
205 East 42nd Street, New York 17, N. Y.

ALASKA
Anchorage, Reeve Alaska Airmotive, 2424 E. 5th Ave.

ARIZONA
Phoenix, Charlie C. Jones Battery & Elec., 300-322 West Jefferson St.

CALIFORNIA
Bakersfield, Automotive Diesel & Electric Co., 1017—30th Street
Los Angeles 21, Magneto Sales & Service Co., 751 Towne Avenue
Sacramento, Langner & Rifkin, 1116—15th Street
San Diego 1, Electric & Diesel Service Co., 1254 Kettner Blvd.
San Francisco 3, Furrer & Uster, Inc., 225—7th Street
Wilmington, Diesel Control Corporation, 218 North Marine Ave.

COLORADO
Denver 3, Central Supply Co., 1171 Lincoln Street

FLORIDA
Jacksonville 1, Spencer Electric Co., Inc., 40 West Beaver Street
Miami 36, Florida Diesel Service Co., 1930 North Miami Ave.

GEORGIA
Atlanta 3, Auto Electric & Magneto Co., 477 Spring Street, N.W.

ILLINOIS
Chicago 16, Illinois Auto Electric Co., 2011-37 Indiana Avenue
Rock Island, Lahse Automotive Service, Inc., 430—17th Street

INDIANA
Indianapolis 4, Gulling Auto Electric, Inc., 450 North Capitol Ave.

IOWA
Cedar Rapids, Hogans Carburetor & Electric Co., 209 Seventh St., S.E.
Des Moines 9, Electric Service & Sales Co., 1313 Walnut Street

KENTUCKY
Louisville 4, Ellingsworth Auto Electric Co., 1003 East Broadway

LOUISIANA
New Orleans, Gerhardt's Fuel Injection Service, 2501 Jefferson Highway
New Orleans, John M. Walton, Inc., 1050 Carondelet St.
Bossier City, Vaughan Tractor & Auto Parts Co., 605 West Street
Mail Address: P.O. Box 661, Shreveport, La.

MARYLAND
Baltimore 1, Parks & Hull Automotive Corp., 1033 Cathedral St.

MASSACHUSETTS
Newton Upper Falls, W. J. Connell Co., 210 Needham Street, Newton Industrial Center

MICHIGAN
Detroit 2, Knorr-Maynard, Inc., 5743 Woodward Ave.

MINNESOTA
Minneapolis 6, Diesel Service Co., 2509 East Lake St.
Minneapolis 2, Reinhard Bros. Co., Inc., 11 South 9th Street

MISSOURI
Kansas City 8, Electrical & Magneto Service, Inc., 2538 Grand Avenue
St. Louis 23, Diesel Fuel Injection Service Co., 9331 South Broadway

NEBRASKA
Omaha 2, Carl A. Anderson, Inc., 16th & Jones Street

NEW JERSEY
Newark 2, Tire Trading Co., 239 Halsey Street

NEW YORK
Brooklyn 32, A & D Diesel Service, Inc., 145—21st Street
Brooklyn 16, E. A. Wildermuth, Inc., 1102 Atlantic Avenue
Buffalo 8, Hettrich Electric Service, 1032 Ellicott St.
Troy, Ehrlich Electric Service, Inc., 200 Fourth St.

NORTH CAROLINA
Raleigh, Diesel Injection Service, 200 Fourth Ave.

OHIO
Cleveland 14, Cleveland Ignition Co., 1301 Superior Ave., N.E.

OKLAHOMA
Tulsa 3, Magneto Ignition Co., 701 West Fifth St.

OREGON
Portland 14, Automotive Products, Inc., 1700 Southeast Grand Avenue

PENNSYLVANIA
Hazleton, Penn Diesel Service Co., No. Church at 27th St.
Philadelphia 32, J. W. Parkin, Jr., 2251 N. Broad Street
Pittsburgh 13, Automotive Ignition, 6358 Penn Avenue

TENNESSEE
Memphis 4, Automotive Electric Service Co., 982 Linden Avenue

TEXAS
Corpus Christi, Womack Bros., 2002 Leopard St.
Dallas, Beard & Stone Electric Company, 3909 Live Oak St.
El Paso, Reynolds Battery & Magneto, 801 Myrtle Avenue
Houston 1, Beard & Stone Electric Company, Milam at Polk St.
Houston 11, Magneto & Diesel Injector Service, 6931 Navigation Blvd.
Odessa, Electric Service & Supply, 1601 N. Grant St.
San Antonio 3, Womack Bros., 123 West Carolina

UTAH
Salt Lake City 2, Diesel Electric Service & Supply Co., 60 East 13th St., South

VIRGINIA
Norfolk, Diesel Injection Sales & Service, 808 Union Street
Richmond 20, Charles H. Woodward Electric Company, 709 Broad St.
Salem, Diesel Injection Sales & Service, 814—8th Street

WASHINGTON
Seattle 1, Seattle Injector Co., 2706 Second Ave.
Spokane 8, Sunset Electric Co., North 703 Division St.

WISCONSIN
Milwaukee 2, Wisconsin Magneto Co., 918 North Broadway

Canada

ALBERTA
Calgary, Hutton's Ltd., 131—11th Ave., West

BRITISH COLUMBIA
Vancouver, Magneto Sales & Service, Ltd., 126 Gore Ave.

NEW BRUNSWICK
Fredericton, Stairs Brothers, 493 Northumberland Street

NEWFOUNDLAND
St. John's, A. H. Murray & Co., Ltd.

QUEBEC
Montreal, International Electric Co., 1037 Bleury St.

ONTARIO
Toronto, Diesel Equipment Ltd., 139 Laird Drive, Leaside

Mid-Continent Diesel News

By Jack F. Cozier

TRANSPORT Lease Company, Denver, Colorado, has in operation a Kenworth tractor powered by a Cummins model NHRBS-600 diesel engine. This unit logged 216,000 miles of rugged mountain travel before overhaul.

PUBLIC Service Company of Oklahoma, Tulsa, Oklahoma, has just purchased a Unit 1020A crane from Midwestern Engine & Equipment Co. The crane is powered by a Chrysler 16A gas engine and will be used on steel erection for their expansion of their Tulsa plant.

CITY OF Hominy, Oklahoma, municipal power plant has just bought a Cooper-Bessemer 1000 kw JS-8-GDT-SG (tri-fuel) generating engine.

CARMACK Drilling Company, Denver, Colorado, has in operation a Lee C. Moore mast powered by four NHBI-600 Cummins diesels. These engines operate a Gardner Denver mud pump through a Twin Disc torque converter.

CAPITOL Steel & Iron Company, Oklahoma City, Oklahoma have purchased a model 12 Murphy diesel, powering a Northwest 41 crane. The purchase was made through the Wylie-Stewart Machinery Co., Oklahoma City.

PRODUCERS Chemical Co., Borger, Texas, has purchased a GM 2-71 diesel engine for driving a well servicing unit from Diesel Power, Inc., Plainview, Texas.

HOPPER Truck Lines, Phoenix, Arizona, is using two Kenworth tractors powered by Cummins NHB-600 diesels. The tow units have logged 100,000 miles without failure.

D. R. LAUCK Oil Company, Wichita, Kansas, has purchased two model 22 Murphy diesels for repowering a rotary drilling rig. Mud pump and Unit Rig drawworks are compounded. The transaction was handled by Manufacturers Distributing Company, Great Bend, Kansas.

OKLAHOMA-MISSISSIPPI River Products Line, Inc., has in operation for two months six Cooper-Bessemer gas-diesel (dual-fuel) engines at Conway, Ark., Wynnewood, Oklahoma, Sunray, Okla., and Allen, Okla.

FARMERS Coop, Talequah, Oklahoma, has purchased a GM 4-71 diesel engine for repowering a feed mill, from Diesel Power Co., Tulsa, Oklahoma.

S. R. SMITH, sewer contractor, Tulsa, Oklahoma, has purchased a 1020A Unit back hoe powered by a GM 4-71 diesel engine from the Mid-Western Engine & Equipment Co., Tulsa, Oklahoma.

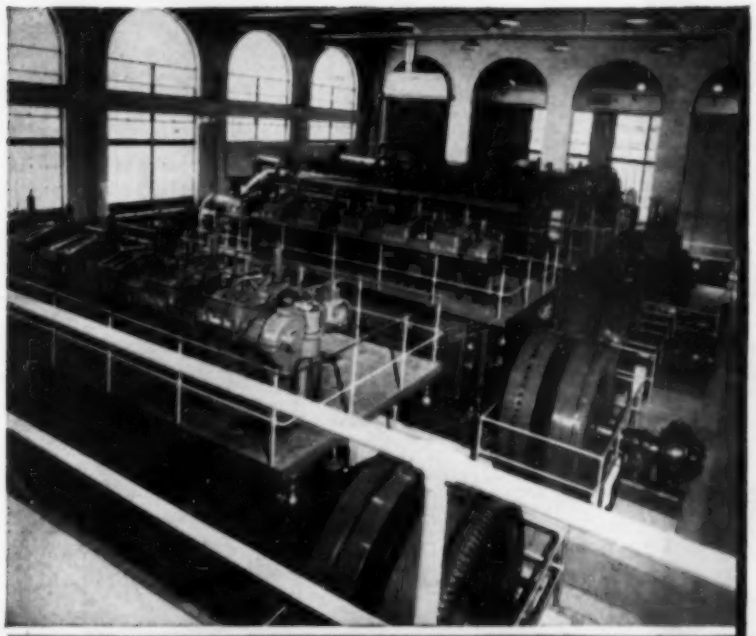
GREAT Western Drilling Co., Midland, Texas, installed the new Cummins PT fuel system on four Cummins NHRBIS-600 diesel engines and in drilling approximately 22,000 ft. of hole with these same four engines, not one minute of down time was experienced.

CITY Department Waterworks of Booneville, Arkansas, has purchased a Bethelehem pumping unit powered by a Hercules DIX4D diesel engine from Hercules-Lupfer Engine Sales Co., Tulsa.

COLE-CARLEY-HUDKINS, Oklahoma City, Oklahoma, have purchased a model 12 Murphy diesel, powering a Northwest 41 dragline

PRYOR Concrete Company, Pryor, Oklahoma, has purchased a GM 4-71 diesel engine to repower a clam shell crane.

SYSTEM Tank Lines, Inc., Arizona, has in operation 55 Peterbilt tankers all powered by Cummins NHB-600 diesels.



Maintenance of plant buildings and equipment make this light plant a showplace station of which Pierre residents are justly proud.

What Happens When

STANDARD HD OIL

Is Called In on a Ring Sticking Problem

In 1946, after experiencing considerable trouble with ring sticking, Pierre, S. D., Municipal Light Plant management decided to test STANDARD HD oil in their 2,000 hp. diesel engine. Result: nine years later and after 31,840 hours of operation the original fill of STANDARD HD oil is still in the diesel.

Plant Superintendent Floyd Halbert says engine cleanliness is what he values most. "Cleanliness of the oil is outstanding," he reports and says further, "There is almost no carbon, a minimum of cylinder wall wear and complete freedom from ring sticking. There has never been a bearing failure. Maintenance time for lubrication is zero."

A typical record for STANDARD HD oil? Yes. STANDARD HD is helping many other plants establish new performance records, while setting new levels of engine cleanliness for old engines, and keeping new engines clean from the date of initial fill. Result: more and more folks with industrial lubrication problems like the one at Pierre, call for assistance from their Standard Oil lubrication specialist.

Perhaps you would like to find out more about STANDARD HD. In the midwest, call your nearby Standard Oil lubrication specialist. Or contact, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

STANDARD

In addition to the 2,000 hp. engine, Pierre plant has a 3,000 hp. and two smaller engines. All are lubricated with STANDARD HD Oil. Floyd Halbert (right), and Standard Lubrication Specialist Bob Kirk, go over Pierre plant operation sheet. Bob Kirk is an old hand at helping people solve lubrication problems. He's been doing this for Standard since 1943. Bob got his engineering training from the University of Washington. He has also completed the Standard Oil Sales Engineering School. Customers find this experience and training pay off for them.

New Orleans Diesel News

By James W. Calvert

THE fishing trawler *Tadpole,* powered with a Caterpillar diesel engine model D-318, rated at 82 hp, has been delivered to A. B. Silchenstedt of Lake Charles. The vessel is 43 ft long and has a 4.4-1 reduction gear. The engine was sold by Boyce-Harvey Machinery, Inc. of New Orleans.

MUTUAL Oil Company of Birmingham, Ala., has repowered its tug *Louisiana IV* with an Enterprise diesel engine model DMG-6 rated at 425 hp at 400 rpm. The engine was sold by the New Orleans branch of Enterprise Engine and Machinery Co.

TWO Enterprise diesel engines, model DMM-363, rated at 480 hp at 900 rpm, have been sold to Burton Construction Company of Port Arthur for repowering a river towboat.

MECHANICAL Equipment Co., New Orleans, has just completed construction of a 65-ft offshore crew boat, the *Buda Driller,* for a major oil company. Powered with twin Buda diesel engines, model 8DATMR 1125, rated 385 hp at 2100 rpm, the vessel has a speed of 24 mph and can carry 30 in bus-type seats.

COYLE Lines' towboat *Houston* has been repowered with a pair of six cylinder Fairbanks-Morse diesel engines, rated at 960 hp. The engines were sold by the New Orleans office of Fairbanks Morse Company.

TWO gager utility boats, 36 ft long and power with Buda diesel engines, model 6 DAMR273, have just been delivered to Shell Oil Company by Mechanical Equipment Co. for use in shallow water oil fields. The engines are rated 48 hp at 1600 rpm and have 2 to 1 Capital hydraulic reduction gear.

A 34-ft twin screw Sewart Seacraft personnel boat, designed for transporting offshore drilling crews, has just been delivered to George Jacomine of Buras, La. by George Engine Co., Harvey. It is powered with a matched pair of GM inclined diesel engines, model 4087-88, rated 151 hp each.

THE 65 ft twin engine offshore tug *Shirley Jones,* built by Mechanical Equipment Co. for Richard Morgan Jones of Houma, La., has just been completed in the Pelican Marine and Ironworks yard in Houma. The tug is powered with two Buda diesel engines model 8DCMR2505, which have a maximum rating of 388 hp at 1300 rpm, and has two Buda diesel 16 kw generators. A feature of the tug is the Meco hydraulic steering with full followup, designed by Mechanical Equipment. The vessel has two 56 by 48 in. four-blade propellers.

A 40-TON Clyde crane belonging to Levingston Shipbuilding Company, Orange, Texas, has been repowered with a GM diesel engine model 6030C, equipped with twin disc hydraulic coupling and clutch. The engine was sold by George Engine Co., Harvey.

Receives Additional Order

Fairbanks, Morse & Co. has received an additional order from the Virginian Railway Company, Norfolk, Virginia, for eighteen diesel electric locomotives, according to Robert H. Morse, Jr., president. "When delivered, this will make a total of 43 Fairbanks-Morse diesel locomotives on this property," said Mr. Morse. "This latest order calls for 1600 hp. units which will be used for the dieselization of the East end of the railroad from Roanoke to Hampton Roads."

The locomotives will be manufactured at the Beloit, Wisconsin, Works of the Company, with delivery starting at a very early date.

West Coast Diesel News

By James Joseph

IN COOPERATION with both Elliott Co. and Brown Boveri, Union Diesel Engine Co. has designed a supercharger for engines 20 or more years old—this type of power boosting previously believed impossible outside of experimental labs. Says Union's vice president, S. W. Newell, "it has long been customary for engines to be supercharged only when certain features were built into the engine initially or at time of conversion with considerable expense. Recent project costs have been reduced by one-third . . . sometimes even more . . . than previously possible."

HYDRAULIC Dredging Co. has purchased the tug *Clara*, repowering her with a GM 6-71, with 4½:1 reduction, swinging a 48x34 prop for towing operations, particularly in moving the company's dredges.

TO THE Ruth gold mine near Torona, Calif., two Caterpillar electric sets. Mine is now completely electrified with Caterpillar diesel sets, announces Los Angeles' Shepherd Tractor and Equipment Co.

CURRENTLY building for the SF Towing Co. (by Pacific Coast Engineering Co.) is an oil barge, its cargo pumps powered by two GM 6-71 heat-exchanger cooled engines.

TO POWER winches destined for the U. S. Navy, two 35 hp Buda diesels with Torcon torque converters, purchased by Paramount Steel Co.

FOR THE Indian Agency, a 500 hp Buda LPG power unit, to run a 200 kw generator, via Salyers Equipment Co.

A. PELLIGRINI and Nick Ciandro are repowering their 32-ft. commercial fishing boat *Nick* with a GM 4-51 marine diesel with 2½:1 reduction gear. *Nick* will operate the Monterey Bay area, trolling for salmon and other commercial catches.

PACIFIC Gas & Electric Co. has purchased (from Berkeley, Calif.'s West Coast Engine and Equipment Co.), a 30 kw GM power generator set for automatic emergency standby at their headquarters building in Oakland. Generator is powered by a GM 4-51, turning 1800 rpm. Automatic control panel will start-stop unit within three seconds after power failure or following power resumption.

ANDERSON-BEVIER Co., Inc. has delivered to Salyers' Equipment Co. (Los Angeles) two 170 hp Buda diesels for 75 kw generators.

TWO GM 4-51s will power the 36-ft. Stephens Cruiser recently ordered by Santa Cruz' Anthony Petti, a member of the Moss Landing yacht club. Engines will drive through 2:1 gears, with top speed of the cruiser between 17-19 mph, cruising speeds of 13 or 14.

FOR OPERATION of a saw mill head rig near Yorkvale, Calif., Swen Gumer (Cloverdale, Calif.) has taken delivery on a new 6-110 radiator-cooled GM diesel. Engine, installed during this winter, will be ready for operation when mill opens after first of year.

SHEPHERD Tractor & Equipment Co. has adapted three Caterpillar No. 90 scrapers to the Caterpillar DW20 tractor. Originally, the No. 90 was designed as a pull scraper, for use with track-type tractors. Reinforced and modified draft tube and yoke assembly, plus adoption of standard DW20 hitch, gives contractors a scraper with a max. cap. of 31 yards, travel speeds up to 34 mph.

WEYERHAEUSER Timber Co., North Bend, Ore., has repowered a Link-Belt shovel with a new Buda model L-525 gas engine, via Hamilton Engine Sales, Inc., Portland.

TO FRIEDRICH Mill Co., Port Orchard, Washington, a radiator-cooled GM 4-51 to drive an American Edger in the company's sawmill.

OVERSEAS bound to power a rice mill are a pair of 30 kw diesel generator sets, consisting of a Model 3-71 GM, directly connected to Palmer self-regulated generators. Sale through Evans Engine and Equipment Co., Inc., Seattle.

U.S. ENGINEERS at Portland, Ore., have taken delivery on two 22-ft. personnel boats powered by Buda 6DAMR-273 marine diesels. Boats will transport personnel from shore to various engineering dredges.

PORTLAND, Oregon's Mixermobile-Wagner Tractor, Inc., has purchased two 6DT-468 engines to power TR-9 tractors and one 6DT-317 Buda diesel, for a TR-6 tractor.

FOR Bellingham Tug & Barge Co., Bellingham, Wash., a GM 2-51, 27 hp marine auxiliary unit to drive a Worthington Compressor and Deck Winch on the tug, *Barney, Jr.*

A TRAILER-MOUNTED, 100 kw, Caterpillar D17000 diesel electric set—to Douglas Aircraft Co. for use at Edwards Air Force Base, Calif. Unit has a 27 circuit breaker panel, with plugs for both single and three-phase.

Occupying New Building

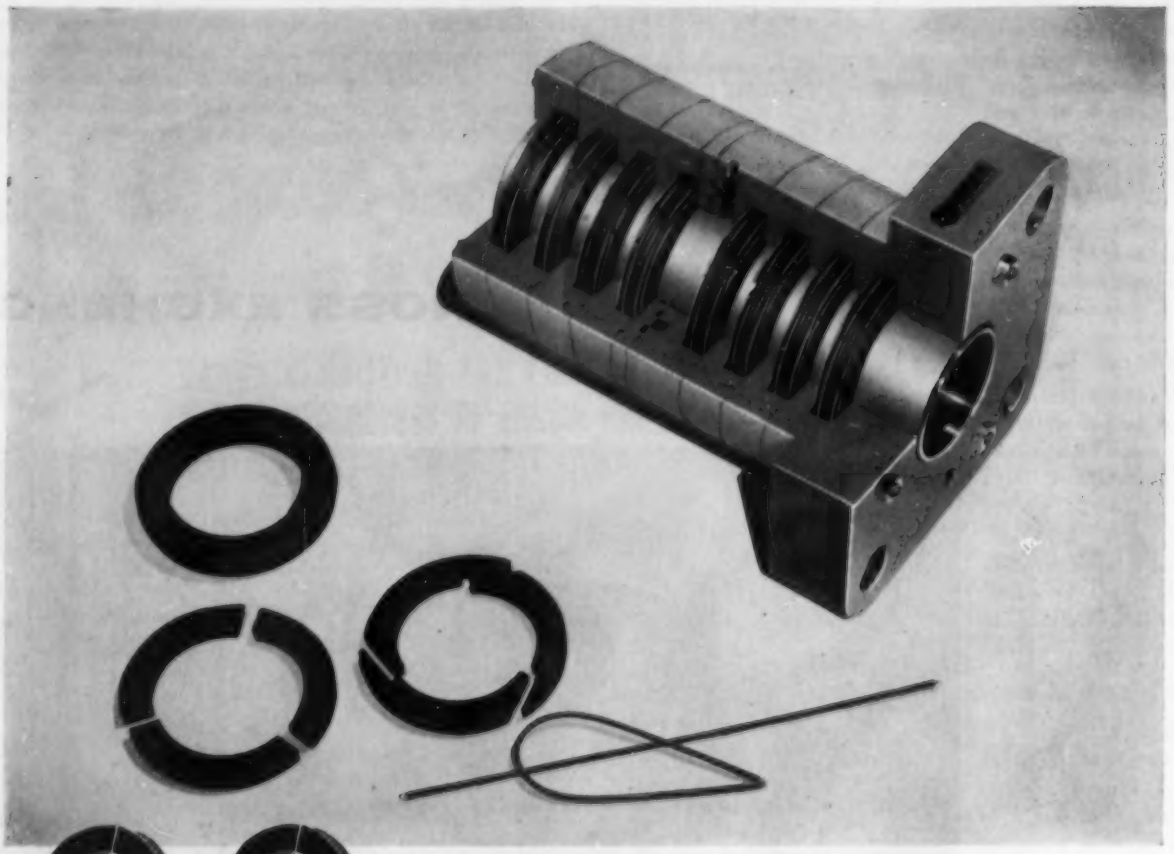
Diesel Enterprises, Inc. of Garden City Park, L.I. are now occupying their new and modern building located at 161 Herricks Road. This company specializes in the servicing of diesel fuel injection pumps, nozzles and injectors. Associated with Diesel Enterprise is an old timer in the diesel field, Bill Fetherston as sales manager. Bill was formerly with American Bosch Corp., as N. Y. district manager. Diesel Enterprises was founded in 1949 by Jack La Mont who has manys years of diversified experience in the field of engineering, sales and service relating to diesel engines.

Joins Trane

Harry F. Griese has been appointed to the Refrigeration Sales Department in La Crosse, Wisconsin, according to a recent announcement by The Trane Company, manufacturing engineers of heating, air conditioning, ventilating and heat transfer equipment. Mr. Griese was a 1948 graduate of Duke University where he received a bachelor of science degree in mechanical engineering. He has also done graduate work at Stevens Institute and Western Reserve University. He is a member of Pi Tau Sigma, honorary mechanical engineering fraternity. He came to The Trane Company after acquiring experience as an application, development and sales engineer in air conditioning and refrigeration. He is a member of A.S.H.V.E., A.S.R.E. and N.A.P.R.E.

Bulletin

Ingersoll-Rand has recently published a new 12-page, 2-color bulletin describing their vertical multi-stage pumps. It includes sectional drawings, dimensions and installation views of the pumps in service. These units, designed for boiler feed, refinery, process and booster service, are available for all pressures up to 1,500 psi with capacities to 3,500 gpm. The simplicity of design and self-contained construction of the pumps allows installation in less space, better operation at a lower cost, and less "time out" for maintenance. The complete mechanical balance, careful selection of materials, and the segmented inner casing assembly are a few of the many refinements that add up to high overall operating economy. For copies of this new bulletin, Form 7096, contact your nearest I-R branch office, or write to Ingersoll-Rand Company, 11 Broadway, New York 4, New York.



Look to COOK

for *Better* Non-Lubricated CARBON PACKING

COOK carbon packing rings are made of a special carbon graphite material that automatically assures you *high resistance to wear, chemical inertness and excellent heat conductivity.*

COOK Rings *in any case* make for a better seal — but when placed in a *Cook case* assure you the perfectly engineered carbon packing. If you have sealing requirements for non-lubricated compressors, write today for a sample carbon ring, plus literature on Cook's complete line of packing materials. Address C. Lee Cook Manufacturing Co., 942 South Eighth Street, Louisville 3, Ky.

C. LEE COOK MANUFACTURING CO.

Sealing Pressures Since 1888

This Caterpillar D318 Diesel—powering a crane—works through a Twin Disc Model CF Torque Converter which provides faster work cycles, protects both engine and driven equipment. Behind the Model CF are a Twin Disc Reverse Gear and two Twin Disc Heavy-Duty Friction Clutches.

Why the trend is to Torque Converters

Planning to order a new power unit?

Today, many equipment owners are planning on getting *more* work output . . . and *longer* equipment life: they're ordering their new power units *complete* with Twin Disc Torque Converter Drive. And they're having Torque Converter Drive installed on equipment already working in the field.

Why? Briefly, here are six *proven* reasons why: 1 Through the Twin Disc Three-Stage design, their engines' output torque is *multiplied up to six times* . . . the highest torque multiplication available. Consequently, they're *eliminating* harmful, costly engine lugging and stalling. 2 With Torque Converter Drive, their engines are working up in the maximum efficiency range *all* the time, delivering *constant* high-horsepower output. 3 Power is *automatically* matched to the load demand, with gear-shifting minimized or eliminated. 4 Heavy load pick-up is *smooth, even, without* clutch-slippage. 5 Overloads, shock loads, vibrations and torsional variations are cushioned *out,* through *fluid* connection . . . which means *longer* life, *less* maintenance on engines, transmissions, clutches, drive line components *and* driven equipment. 6 Torque Converter Drive provides an *infinite* variety of ratios to work with, permitting *smooth, accurate control* of the load and delicate "inching" or "holding" under power.

So if you're thinking about a new power unit . . . or thinking about present equipment needing more power, more performance . . . *be sure to get the facts on Torque Converter Drive.* Ask your engine dealer. Or write *today* to Twin Disc Clutch Company, Hydraulic Division, Rockford, Ill., for Bulletin 135-D.

By providing the most COMPLETE line of Industrial-Type Torque Converters available, Twin Disc can accommodate any type gas or diesel engine up to 650 hp—with practically any hook-up. Three series, or sizes, of Three-Stage Torque Converters are provided, with 7 capacities in each size through internal blading variations. A total of 20 different input, output combinations are available, making Twin Disc Torque Converters easily adaptable to any type installation.

TWIN DISC

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

The Engineer's Report

CASE HISTORY
RPM Delo Oil R.R.
LUBRICANT

Western Pacific R.R. Co.,
FIRM

Special oil maintains high average mileage record!

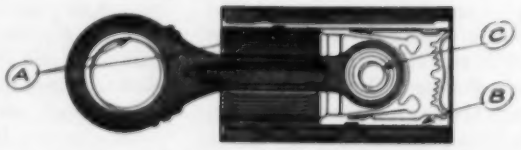
1776 CYLINDER ASSEMBLIES make up the 111 diesels in road freight service on the Western Pacific R.R. These units, as well as all passenger locomotives on the line, are lubricated with RPM DELO Oil R.R. Maintenance records of several years on freight locomotives show following average actual miles on parts removed for any reason: wristpins and bushings, 413,675 miles; pistons, 376,018 miles; liners, 364,101 miles. A representative assembly is shown in insert, just as it appeared after 476,497 actual freight miles. Note cleanliness of parts and free rings—typical of Western Pacific's experience with RPM DELO Oil R.R., the standard on the line since 1949.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARKS "RPM DELO" REG. U. S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

New Municipal diesel plant in foreground; steam plant, now closed down, in background. Dieselization began in 1939, was completed in 1954.

HILLSDALE, MICHIGAN

By R. L. GREGORY

HILLSDALE is another of the Michigan municipalities which recently found it necessary to add another unit to the generating capacity of its municipal plant. It has operated a combination steam and diesel plant in an efficient manner for many years, giving its citizens a maximum of service at all times. Hillsdale enjoys a record for continuity of service seldom attained by other plants. The few interruptions experienced have been caused by "acts of nature."

Before going into the discussion of the new addition, let the writer summarize what the situation was prior to World War II. In 1937, the plant consisted of four steam turbines, with a rating of from 300 to 1500 kw. capacity, and a total rated capacity of 3175 kw. These units were supplied by four Sterling-type boilers at 160 psi. The peak loads at that time ran around 2000 kw. Some of this equipment had been installed as early as 1914, when Corliss-type engines were used to drive belted generators. As this type of equipment became obsolete, the first turbine was installed in 1920. This was a Parsons-type unit, rated at 300 kw. In those days, it was the last word in small turbine design. Through the succeeding years, additional turbines were installed and in 1931 the largest, a 1500 kw. unit, was put into operation. These handled the load very nicely until 1938, but in 1937 the city fathers deemed it advisable to add to the generating capacity of the plant. This was necessitated by the growth of industry and population.

After a careful study of its power situation by Hamilton, Weeber & Ward, consulting engineers, it was finally decided to build a new diesel building capable of housing two units, adjacent to the steam plant. This program was carried out and in September, 1939, the first diesel unit was placed in operation. It was used as a standby and peak load unit until December, 1941. It was a six-cylinder Nordberg two-cycle engine, rated at 2250 bhp. at 225 rpm., of the air-injection type and drove a 1500 kw. Allis-Chalmers generator, 2500-volt, 3-phase, 60 cycle.

The Nordberg operated on Michigan #5 heavy straight-run fuel, and was capable of turning out better than 12 kw. per gallon of oil. However, with the advent of the war, this unit no longer was used as a standby and peak load unit, but became a part

New 10-cylinder, 4200 bhp Nordberg diesel. It is equipped with Bosch fuel injection equipment, Dollinger air filter, Manzel lubricators, Ross heat exchanger and Woodward governor.

of the daily operating equipment and worked right along in conjunction with the steam units for approximately 19 hrs. a day. During the first three years of the war, the load demand was such that all steam units as well as the diesel were operating most of the time nearly at rating. During peak periods, they often exceeded 10% overload. This was rather a critical situation, as it gave no outage time for maintenance except during the hours from midnight to six in the morning or on Sundays and holidays. This was hardly enough time for proper preventive maintenance, but by careful planning, the units carried on with only one outage period of about 6½ hrs. due to a breakdown on the compressor. The plant had to cut off some of the distribution circuits for that outage period, while repairs were being consummated.

This incident, along with the age of the steam plant equipment, gave the city fathers the clue to try and get a second diesel installed. However, priorities, lack of materials and the necessity of placing available generating equipment in other plants, caused the War Production Board to turn down their request until the war had ended. Then, in 1946, they were successful in securing another Nordberg. This unit was a nine-cylinder, two-cycle job, rated at 3600 bhp. at 225 rpm. This engine has mechanical injection, and is a cross-head type unit driving a 2750 kw. generater rated at 2500 volts, 3-phase, 60 cycles. It also used the same type of straight-run fuel that the original unit operated on and was capable of turning out approximately 14.25 kw. per gallon of oil. This unit was placed in commercial operation in November, 1947.

I am mentioning at this time the fact that synchronizing of these units with the steam plant system was handled by the steam plant operators at the steam plant board, inasmuch as the system distribution panels and generator panels were all located in the old steam plant. Emergency trip switches and governor controls on both diesels were available in the diesel plant in case of emergency. But under normal operation, once the units were synchronized with the system, they were normally handled load-wise by the steam plant operators. However, it had been in the minds of the engi-

Field Test on 3200 KW Diesel Engine Generator Unit—Board of Public Works, Hillsdale, Michigan

Nordberg Unit No. 2012-0845—TS-2110—21½" x 31"—225 RPM—June 2 & 3, 1954

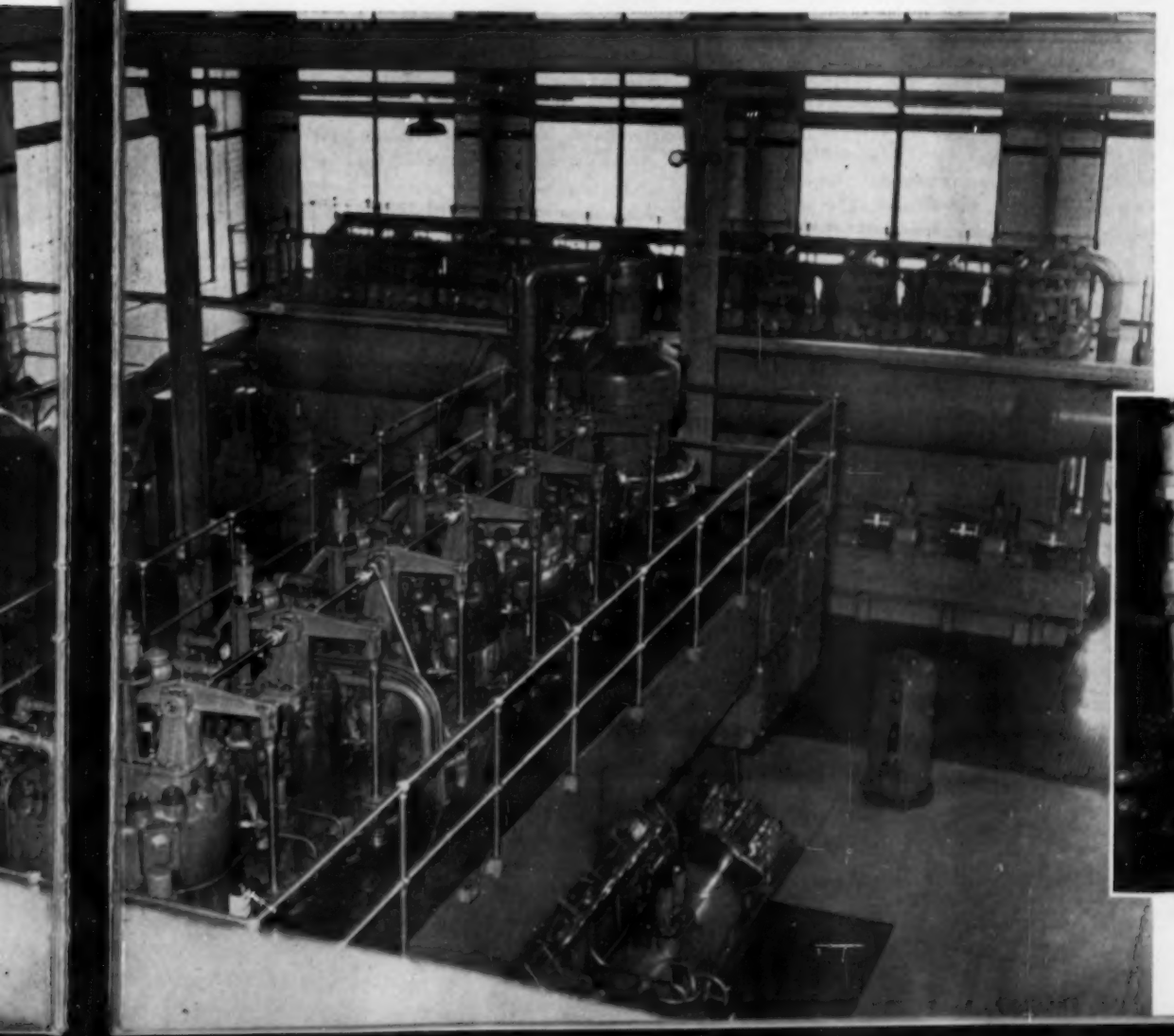
	KWH Meter Disc Kh = 3200					Fuel						
Test Load %	Time Start	Time Stop	Disc Turns	Total kwh	Avg. kw Load	Time Start	Time Stop	Total Lbs.	Lbs./kwh As Used 19,238 btu per lb.	Lbs./kwh Corr. to 19,350 btu per lb.	kwh Per Gal. As Used 19,238	Contract Fuel Guar. lbs./kwh
50%	3:06	4:06.28	504	1612.8	1605	3:06	4:06.28	804	.498	.496	15.05	.572
75%	4:47	5:48.22	777	2486.4	2436.6	4:47	5:47.46	1202.5	.494	.492	15.16	.532
100%	11:35:37	3:35:47	4051	12,963.2	3240.8	11:34:47	3:34:47	6334.5	.489	.487	15.33	.528
110%	4:14	5:14.83	1117	3574.4	3525.6	4:13	5:13.83	1771.5	.496	.494	15.11	

neers, that the whole generating system, as well as the distribution system, would sooner or later be changed from 2500 volts delta to 4160 volts wie. Then, the generator switches, as well as the distribution circuits, would be handled through new outdoor switchgear, thus removing the oil breakers from the steam plant and control the new switching arrangement by remote control.

This setup worked out very well from many angles until 1951, when another spurt in industrial, commercial and domestic use of power and light demanded the installation of still further generating equipment. This was proven by a survey and graph worked out by the engineers, looking 10 years in the future. So, early in 1952, the wheels were set in motion for an expansion program. Plans were drawn up for an addition to the old diesel plant and construction started. This building is large enough to house two large Nordbergs. The order for the first of these Nordbergs was placed in March, 1952. In placing this order, it was decided to make the first step toward the 4160 volt system. This entailed a lot of preliminary work.

Five new switchgear outdoor cubicals were ordered—two generating and three distribution cubicals. New cable ducts and cables had to be installed not only between the diesel plant and the outdoor cubicals, but also between the steam plant and the cubicals. Also, in the construction of the new addition, the old runways and ducts had to be removed and temporary new ducts installed with proper cables between the first two diesels and the steam plant, until such time as these two units could be converted to 4160 volts. This further required a new 5000 kw. transformer, and a 600 kw. bus-tie transformer and a complete revamping of the outdoor structure to say nothing of wiring changes on the old units.

Three Nordberg engines, with newest one in background. Burgess-Manning silencers are used with an Allis-Chalmers single-stage, scavenging blower. Overhead crane is a Manning, Maxwell & Moore.

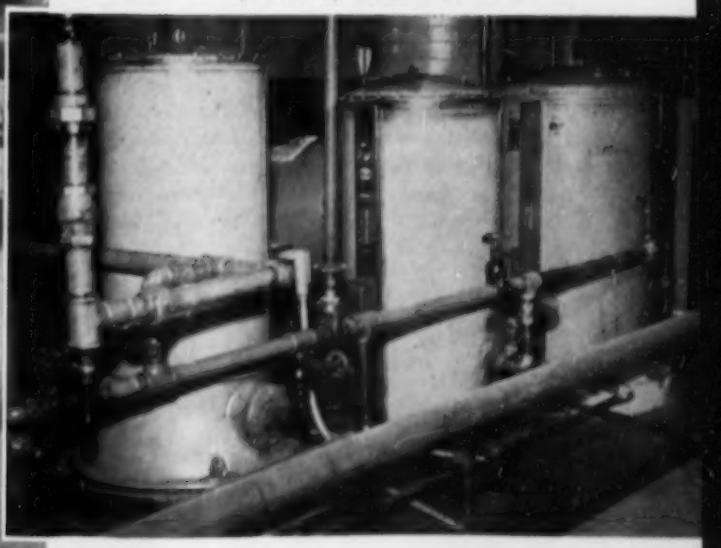


The new Nordberg was dedicated June 26, 1954, and on October 6 it took over so the steam plant could be closed down. After a complete overhaul, the steam engines will be used only for peak loads and emergencies. Records are being kept to show comparative costs—subject for a later article.

List of Equipment

New engine—Nordberg 10-cylinder, two-cycle, mechanical injection, trunk-type, 21.5-in. bore, 31-in. stroke, rated 4200 bhp. at 225 rpm.
Generator—Allis-Chalmers 2750 kw. or 4375 kva., 4160 volt, 3 phase, 60 cycle.
Heat exchangers—Ross.
Fuel injection equipment—American Bosch.
Governor—Woodward.
Muffler—Burgess-Manning.
Switchboard and gear—Allis-Chalmers.
Air filters—Dollinger.
Fuel filters—Honan-Crane and Nugent.
Lube filters—Honan-Crane.
Lubricators—Manzel.
Jacket water cooling pumps—Allis-Chalmers
Air compressor—Gardner-Denver.
Starting air and service tanks—Nordberg.
Temperature alarms (in lube oil and water pipes) —Viking.
Water temperature alarm (in Nos. 1 and 10 cylinder heads) —Detroit Lubricator.
Auxiliary lube pump—Blackmer.
Crane—Manning, Maxwell & Moore.
Piping—Flori.

Three Honan-Crane fuel oil purifiers on new engine have an inter-connected system of piping which allows use of any one or any combination.



Extra No. 52 at Green River Bridge, Wyo. All UP freights run as extras, bearing locomotive number as designator. No. 52 was one of first gas turbine locomotives delivered to UP.

GAS TURBINES MAKE HISTORY

(Second of three articles)

Locomotives and Fuels Are Under Constant Examination of Union Pacific Management With Dual Goals of Simplicity in Power Plant and Lower Costs

By CHARLES F. A. MANN

THE Union Pacific Railroad began testing gas turbine electric freight locomotives back in 1950. Today, the UP is operating 25 of these 4500 hp engines alongside some 200 diesels and the newest and largest of the company's steamers. In our first article, printed last month in DIESEL PROGRESS, we reported some of the history and background for Union Pacific's two-way plunge—into pioneering the gas turbines at the same time it was building up the greatest fleet of railroad diesels. In this, the second of three articles, we want to present construction and operating details pertaining to the gas turbine locomotives.

One of the most discussed and misunderstood features of the gas turbine is the exhaust and the noise it makes. Actually, at full speed, the noise is that of a giant steam boiler blowing the safety valve, and at close range is less annoying than that of a 16-cylinder diesel engine, because of its unpitched quality, a sort of gigantic, feathery swoosh. Inside the engineer's control cab, there is absolutely no vibration or secondary noise, and the air intake seems to make more noise than the exhaust. The entire turbine power plant is only 20 ft. long and weighs but 15 tons, mounted.

The turbine is started by the following sequence: First: the heating boiler is left in operating status continually to keep the residual fuel warm. It derives current for the burner motor, water pump, and controls from the storage battery set. Second: when starting up, the operating crew switch on the diesel auxiliary generator set. This consists of a 270 hp. Cummins diesel engine and a 150 kw. generator (210 hp. at 2100 rpm.) 180-310 volts, and a 16.5 kva alternator. Third: at the turn of the turbine control switch, cold diesel fuel oil is fed to the burners after the motoring winding on one of the main generators gets the turbine up to approximately 5800 rpm. from current supplied by the diesel. After approximately 4½ minutes, the fuel control system automatically switches to the hot residual fuel oil when all burners are firing properly and the predetermined temperatures in the control system are reached. The diesel automatically shuts off.

The auxiliary diesel performs a series of unique functions in that it energizes the entire locomotive up to the requirement of providing motor blower cooling air. It supplies dc power to operate the cooling water pump motor, dc lube pump motor, a battery charger set, steam boiler motors and controls, and for excitation of the traction motors during regenerative braking going downhill. When the turbine is completely shut down, the diesel supplies enough dc current to two of the traction motors for hostling in the yards and even setting out a boxcar or two on the road. Also it operates the two air compressors when the main turbine is shut down. Coupled to the dc generator on the auxiliary diesel, is a 16.5 kva alternator driven by a shaft extension to supply ac current for starting fuel pump motor (diesel starting fuel for the turbine), diesel radiator cooling fan motors, and water booster pump motor when the gas turbine is shut down.

When shutting down, the engineer's control switch is turned first to one position which provides switching back to cold diesel fuel, to replace black hot oil in the control circuit and main fuel pump. Then, after the burners are shut off, the diesel auxiliary starts up and remains in operation until manually shut off to leave the locomotive totally shut down. Then it goes back to only the heating boiler which remains in operation as long as the batteries are sufficiently charged, to keep the fuel warm and water pipes from freezing.

While the turbine itself is very light, the bulk and weight of the auxiliaries and accessories and complex control systems make up sufficient added weight, with supplies, to hold the locomotive to the rails. Directly over the four gear-driven traction generators, and the two auxiliary turbine-driven generators on the shaft extensions, is the dynamic brake resistors. Because of long mountain grades, dynamic braking is vitally important and a factor in reducing the turbine hours and air braking load. The dynamic brake will hold as much as the locomotive will pull at any given speed, but its effectiveness drops sharply to near zero in two stages at low speeds, and is most effective at speeds of from 15 to 35 mph. The cooling fans operate only during braking.

Beyond this section is the auxiliary control cabinet, center sand boxes, coolant water pumps, diesel auxiliary engine, coolant water heat exchanger

for turbine lube oil cooler (gear box oil cooled in same circuit), compressor jackets, diesel engine jacket water and lube oil cooler, two air compressors, and two traction motor blowers. The control compartment for the auxiliaries and accessories is on the bulkhead between the main machinery space and the after compartment. The after compartment contains the small heating boiler, main compressed air reservoir, sand and equipment boxes, fire extinguishers and crew's toilet.

The original ten turbine locomotives were equipped with an elaborate system of steam-cleaned fuel oil filters. At first these were believed necessary for handling Bunker C fuel. Experience showed that the fuel could be more cheaply and easily cleaned before being put on the locomotive, and all filters were eliminated. The original 1600 lb. Vapor-Clarkson heating boiler has been cut to a 800 lb. boiler which gives adequate heat.

The turbine rotor is supported at each end and in the middle, at the outlet of the compressor, on bearings supplied by high pressure, cooled, continuously filtered lubricating oil, which also is by-passed to the gear box. Oil is drawn from a sump tank by either the ac or dc lube oil pump. The dc pump is used to flood the turbine bearings before starting and after shutdown. As the turbine comes up to speed, the ac pump (powered from the turbine alternator) comes up to speed and the dc pump is automatically shut down. Oil passes through a water-cooled heat exchanger and is divided between the turbine and reduction gear. Turbine lube oil is again divided between turbine bearings and accessories and the whole system interlocked with safety and warning switches which shut down the turbine in event of failure.

The compressor casting is in four sections carrying the stationary blades and the compressor wheels. The latter, 15 in all, are bolted together in line. The design permits only the minimum area of steel to be exposed to high temperatures. The rim is welded to the wheel core approximately 2 in. inside the bucket seats.

Combustion chamber assemblies require inspection after each 100 hrs. of turbine operation. Cracked, burnt or distorted liners are renewed. Fuel nozzles are replaced and cleaned after each 50 hrs. of operation. The retractable spark plugs used to fire the cold diesel fuel are checked at the same time the nozzles are changed. The first stage nozzle, where the 1300°f. hot gases first leave the combustion chambers, are designed for 8000 hrs. of operation. They are drilled for cooling air to pass through their entire length.

Turbine fuel regulation is an electro-hydraulic governor which automatically controls load and speed. It is interlocked to protect the turbine from excessive exhaust temperatures, and speeds, and for controlling output relative to the throttle position for current input to the traction motors. Turbine speed under load varies from 4800 to 6900 rpm. which indicates a very high rate of fuel consumption at the lower or idling speed. Actually the turbine burns 60% as much fuel at idling as it does under full load. Yet the overall full load thermal efficiency is given at 17%. General estimates indicated a fuel consumption of 350 g p h. of Bunker C fuel under average road conditions. However, the consumption of 24 of the 25 UP turbines for the months of August and September 1954, both Bunker C and diesel fuel, averaged 359.8 gallons per turbine hour.

With extensive heating requirements for heating fuel tanks and by small tracer piping on all water, lube and fuel lines, for both heating fuel and preventing freezing in cold weather; the extensive use of the diesel auxiliary in starting, yarding and to excite the regenerative brake system going downhill, the great fuel-saving steps possible in the future, under continuous operation, lies in shutting the turbine down at every chance. So far, starting and stopping with diesel fuel, in a timed cycle, permits instant cold starts of the turbine without harm. Train operation at full load effects a sharp drop in fuel use.

Total average turbine output, net, is equal to one-third the gross, the other two-thirds being absorbed by the compressor. Parasite load carried by the auxiliary ac-dc generators averages 400 hp. and the maximum turbine output reaches in excess

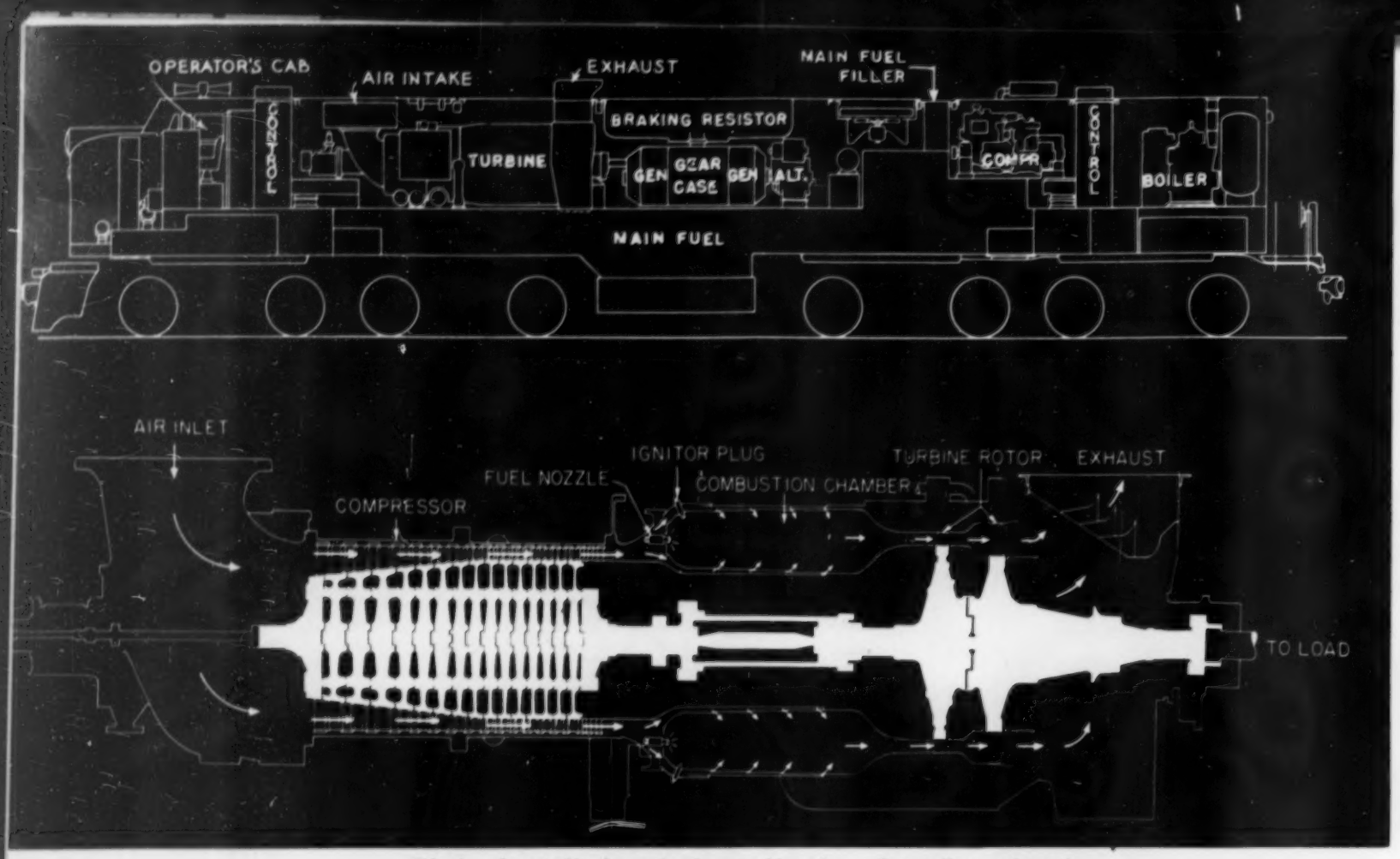
Table II

Miles and Turbine Hours
UP Gas Turbine Locomotives
October 31, 1954

Locomotive Road No.	Placed in Service	Accumulated Miles	Accumulated Turbine Hrs.
51	1-31-52	291,046	12,311
52	4- 9-52	259,803	10,951
53	5- 7-52	251,853	10,489
54	6- 4-52	259,328	10,892
55	7- 9-52	253,861	10,723
56	8-13-52	226,016	9,426
57**	5-20-53	89,752	3,482
58	7 -3-53	133,452	5,674
59	8-12-53	134,237	5,636
60	8-26-53	127,966	5,045
61	4- 1-54	68,940	2,832
62	4-14-54	65,772	2,435
63	5-18-54	55,689	2,102
64	5- 8-54	60,017	2,293
65	6-11-54	48,845	1,856
66	6-23-54	37,162	1,414
67	6-30-54	46,095	1,752
68	7-10-54	35,914	1,402
69	7-28-54	30,865	1,227
70	7-31-54	33,100	1,256
71	8-19-54	21,851	872
72	8-24-54	21,923	851
73	9-25-54	12,849	512
74	10- 2-54	7,780	340
Total, all gas turbine locomotives		2,574,096	105,751

**Locomotive 57 on propane fuel from May 31, 1953 to January 4, 1954, 69,600 miles, 2961 turbine hours, converted to Bunker C fuel January, 1954.
NOTE: Locomotives averaged 107,254 miles, 4406 turbine hours.

This semi-permanent tanker indicates extent to which Union Pacific is carrying its fuel research. Richfield Oil collaborated in testing propane.



Side view of gas turbine locomotive shows machinery layout. Bottom diagram shows air flow of gas turbine for locomotive drive as installed by General Electric for Union Pacific.

of 5600 hp. under favorable temperature and running conditions. This gives a net of close to 5000 hp. to the traction motors at maximum output.

The Union Pacific management has constantly demanded simplicity in its power plants with operation that is foolproof and practically automatic. Great effort therefore was put forth to create a fully self-governing power plant. The long years of research on diesels was used to great advantage.

From the beginning, the heavy fuel consumption has been the chief development target by both UP and General Electric. It was realized that costly diesel fuel was out, but the door was open to everything else. Locomotive No. 57 was set up May 31, 1953 to run tests on using propane gas, and arrangements were made with Richfield Oil Co. to share in this development work. The long fuel research by Union Pacific pointed toward using surplus residues from natural gas on one end and Bunker C and powdered coal on the other. The propane experiment required a 12,500 gallon special car to carry the gas under pressure. The car was semi-permanently coupled behind the locomotive. Steam from the heating boiler liquefied the propane and delivered it at 150 psi. to the burner. After 69,600 miles and 2961 turbine hours, the experiment proved that propane was a perfect fuel from standpoint of perfect combustion and trouble free turbine operation, but handling problems were severe and the cost way too high. No. 57 was converted to Bunker C fuel.

Presence of vanadium pentoxide and sodium sulphate in the fuel ash resulting from combustion of the residual fuel oils reacted with alloy steels in the blading to produce surface and depth corrosion. A trouble-free residual fuel could thus be identified as one of low vanadium and sodium ash content. Cooperative research by General Electric, Union Pacific and Richfield Oil involved a specification establishing controls as follows: 1. The ratio of sodium to vanadium in the ash was not to exceed 0.3. 2. The ratio of calcium to vanadium in the ash was to be not less than 5.0. 3. Magnesium, barium and nickel in the ash were a benefit and could be substituted for calcium on a 2-to-1 basis. 4. The total ash in the compounded residual fuel oil should not exceed 2%.

It was realized that deposits would form on the first stage nozzle and first stage rotor buckets, but this was considered less harmful than the corrosion. Last year it was learned that magnesium gave promise of being more effective than calcium in limiting corrosion and deposits at the operating temperatures existing in these turbines.

The entire gas turbine fleet has now been set up to receive pre-treated residual Bunker C fuel oil from wayside tanks at Green River, Ogden, and Cheynne. Normally, fueling is done at Cheyenne and Ogden. During a recent 30 months, this fuel ranged in price from $1.40 to $1.65 per 42-gallon barrel. The filtering and pre-heating is largely done by the refineries at a cost of about 11¢ per barrel for treatment. It is again filtered at the wayside stations before going to the locomotive tanks. Continuing cooperative research is being carried on to further standardize turbine fuel, and the specifications are readily met by a combination of widely scattered producers of surplus Bunker C fuel ranging from Los Angeles to southern Wyoming.

Diesel fuel ranges from 9 to 10 cents. The UP gas turbine locomotives burn about 4.28 gallons of Bunker C per 1,000 gross ton miles and their diesels burn diesel oil at the rate of about two gallons per 1000 gross ton miles. Therefore, it would seem that when the cost, consumption and efficiency factors (thermal) for gas turbine and diesel on the Union Pacific are compared, total fuel costs are so close as to startle a lot of persons.

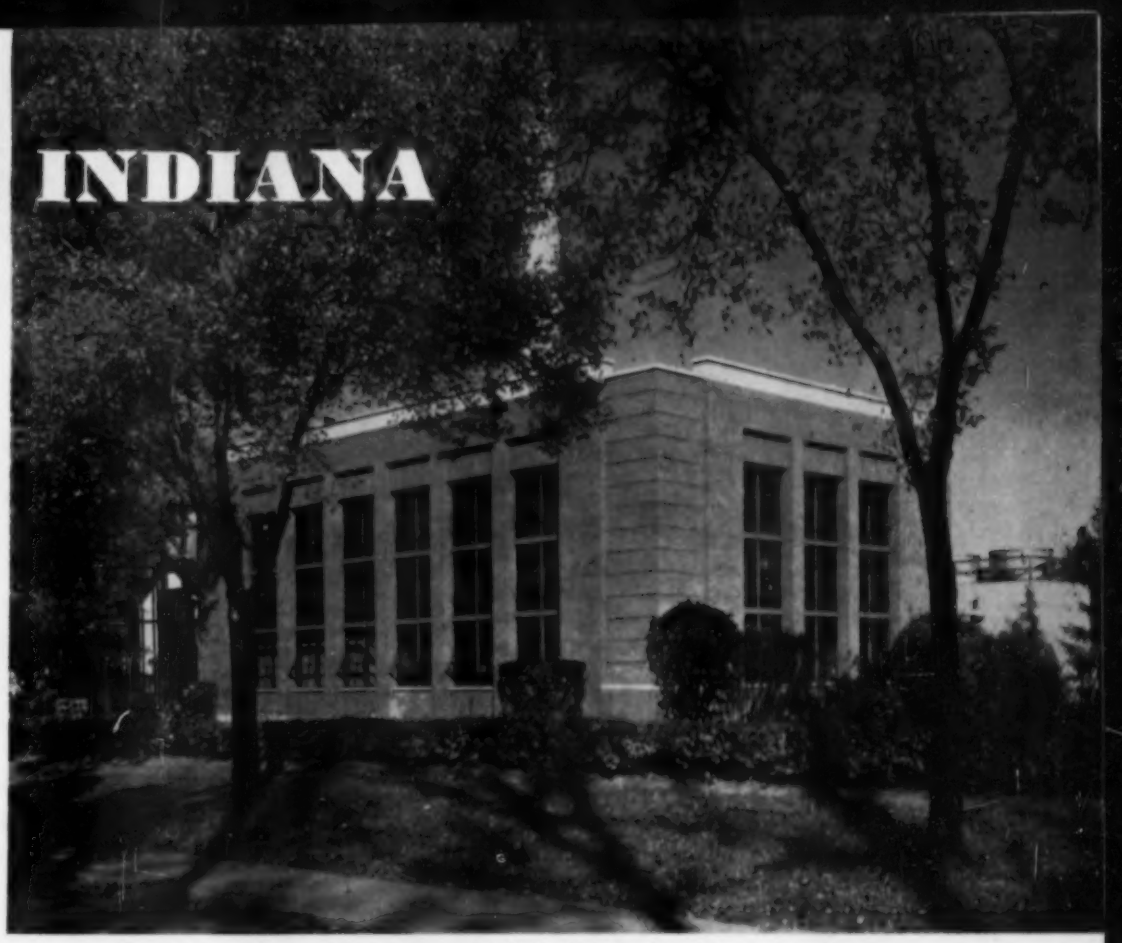
The great question remains as to how far into the future will low Bunker C prices prevail? Will prices start climbing as diesel fuel costs did once the railroads began demanding it by the millions of gallons? Will refinery practice keep on cutting down the output of Bunker C fuel, or will many southwestern refineries keep on with up to 37% of their yield as heavy residual fuel oil? And will the coal turbine people ever get a powdering, portable ball-mill sufficiently compact and efficient to permit blowing powdered coal instead of oil into a gas turbine locomotive? Nobody can say. But Union Pacific has the operating stage set; the know-how; the research facilities. And UP is strong enough financially to weather the thing through to its end—just as it has big steam power right up to today, when the funeral dirge is being played and 110 years of Steam nears finish.

As it will be seen from Table II, the UP is rolling up heavy daily mileage with its fleet of turbines. The last of the 25 went into service in late October. Together, the fleet averages over 8,000 locomotive miles per month, considered excellent for this difficult, mountainous territory. They are hitting close to 110,000 gross ton miles per freight train hour, a figure which may drop as the operations merge into the complete movement in the area. Turbine hours average close to 400 per month and over all availability from 78 to 80%. This is not too significant at the moment in view of the relative newness of the entire fleet.

BLUFFTON, INDIANA

Costs Are Cut $48,000 in One Year by Converting Municipal Plant from Steam to Diesel

By B. H. FREELAND*



Muncipal power net profits have increased 62% in this plant since 1952 when last of steam turbine equipment was replaced by two 3500 hp Fairbanks-Morse diesel engines.

SINCE installation of two new 3500 hp. Fairbanks-Morse diesel engines, the municipal power plant at Bluffton, Ind., has cut fuel costs more than 18% and total production costs more than 20%, rolling up savings at the rate of $48,000 a year. The two new diesels replaced the last of the steam turbines still in service and marked the completion of the plant's conversion from steam.

Bluffton's steam plant dated back more than half a century and its newest and biggest steam turbine was acquired in 1938. Through the years, the price of coal had risen to a high of $9.10 per ton delivered. First corrective measure was the installation of two 1400 hp. diesels in 1947 to help carry the peaks, but despite the service of these units, the average fuel cost for the combined steam-diesel plant was 10.4 mills/kwh. for the year 1951. Total production costs had reached 15.3 mills/kwh. To bring these costs down and to increase overall plant efficiency, city engineers decided to increase diesel capacity to the point where it could carry the entire load with steam relegated to standby service. An analysis revealed fuel costs for a banked boiler are about 10% of costs for a boiler in full service. The same expenditure would finance the purchase of an additional diesel, instantly ready for emergency use and capable of regular, economical service. The steam equipment could be mothballed and could be returned to standby service whenever load growth required full-time use of the standby diesel engines.

In line with this reasoning, it was decided to purchase two diesels. The engines chosen were two 3500 hp Fairbanks-Morse diesels which were put on the line in October, 1952. In 1952, with the new engines in service for three months, the plant shaved fuel costs to 10.1 mills and total production to 15.1. Then the big units really began to roll up savings. During the 12 months of 1953, their first full calendar year of operation, these engines cut the plant's average fuel cost to 8.2 mills/kwh, a reduction of 18.8% from the previous year. They cut total production costs, including maintenance of the steam plant, to 11.9 mills/kwh.

For the 1953 production volume of 15,105,400 kw hrs., the reduction of 3.2 mills from the production cost of 1952 represented a saving of more than $48,000. Coupled with an increase of 2,405,750 kw hrs. in total plant production between 1952 and 1953, the savings introduced by the two Fairbanks-Morse diesels made it possible for the plant's net profits to jump more than 62% in 1953, increasing from a total of $37,297.90 in 1952 to $60,696.95 in 1953. These figures are net profits after deductions for interest and depreciation. Table I gives a clear picture of the effect these two engines have had on the plant's economy since going into service.

The City of Bluffton has a population of about 6200 and serves as the county seat for Wells County in the northeastern part of the state. Largely a manufacturing community, it lists among its industries a foundry, a milk processing plant and factories producing such varied products as electric motors, pianos, auto accessories, farm implements, pretzel-bits and metal stampings. In 1952, these and other commercial and industrial consumers accounted for more than 45% of the total energy sales recorded by the municipal power plant, the remainder going to residential (30%) and rural (25%) consumers. The peak load at the Bluffton municipal plant was 3250 kw in 1953 and gross production volume was 15,105,400 kw hrs., an increase of 19% over the record 12,699,750 kw hrs. produced in 1952. The increased consumption is generally attributed to greater industrial activity among established companies and wider use of modern appliances in the home.

Municipal power at Bluffton has a history which goes back more than five decades to the years immediately preceding the turn of the century. In those days of steam engines and belt-driven generators, the city bought out a small private utility and moved the power house to its present location. In the next 19 years, the city installed two new steam turbines, a 500 kw unit in 1917 and a 1000 kw unit in 1919. The city continued to grow in size and more and more people brought electricity into their homes. In 1928, a 1500 kw steam turbine was added and in 1938 a turbine rated at 2000 kw was installed, the plant's old hand-fired boilers being converted to stoker feed and raised to 200 lbs., 438°f at the same time. These improvements served to modernize the plant's operations and to place it on a more efficient level.

At the end of the next 10 years, however, a concomitant rise both in load and in total operating costs dictated an expansion of the existing generating facilities and the adoption of improved production methods. Influenced by the price of coal, which had risen from $6.29 a ton in 1946 to $7.80 a ton the following year, the plant installed the two 1400 hp Nordberg diesel engines in 1947 to help carry the peaks and to cut overall costs of operation. The addition of the diesel engines succeeded in improving the efficiency and economy of the Bluffton plant over the next few years, but with coal prices continuing upwards to $9.00 a ton in 1948 and with labor and other costs reaching new highs, the plant's net profit dropped from an average of 8.7 mills/kwh in 1946 to 2.2 mills /kwh in 1948. To reverse this trend, the Bluffton plant decided to abandon operation of its steam facilities altogether in 1952 and turned to two 3500 hp. Model 31AD18 Fairbanks-Morse diesel engines to supply the answer to its problems.

In their first 19 months of operation, from October 1, 1952, through April 30, 1954, the 10-cylinder Fairbanks-Morse engines generated a total of 18,434,400 kw hrs., or more than 75% of the plant's

Superintendent, Municipal Light and Water Works, Bluffton, Indiana.

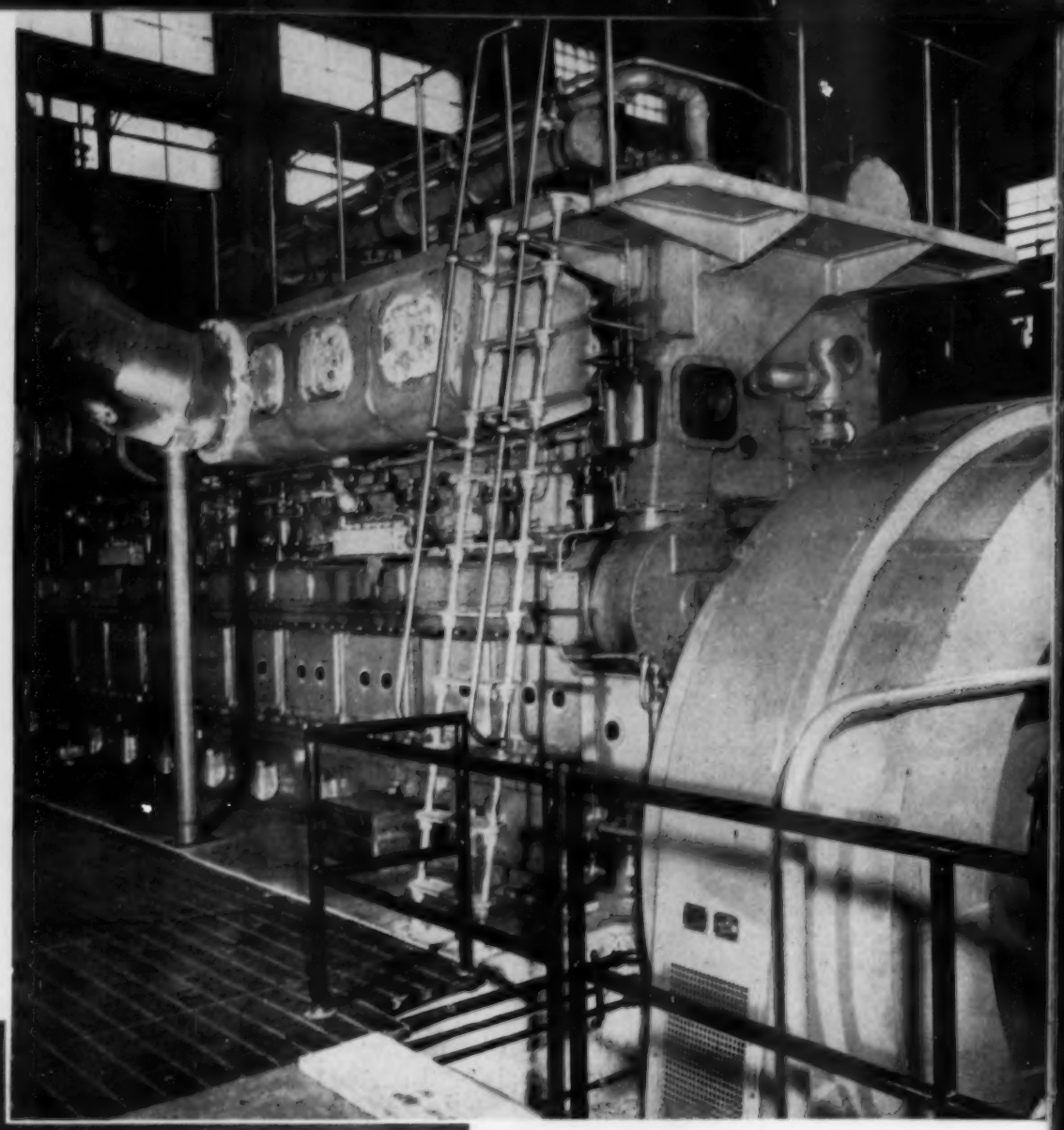
TABLE I

	1952	1953
Gross Kw. Hrs. Generated	12,699,750	15,105,400
Kilowatt Hrs. Steam	5,046,250	—
Kilowatt Hrs.—1400 hp. diesels	5,326,100	5,614,400
Kilowatt Hrs.—3500 hp. diesels	2,327,400	11,491,000
Plant Fuel Cost—Mills/Kw. Hr.	10.1	8.2
Production Cost—Mills/Kw. Hr.	15.1	11.9
Net Profit—Mills/Kw. Hr.	2.9	4.0
Net Profit—Total	$37,297.90	$60,696.95

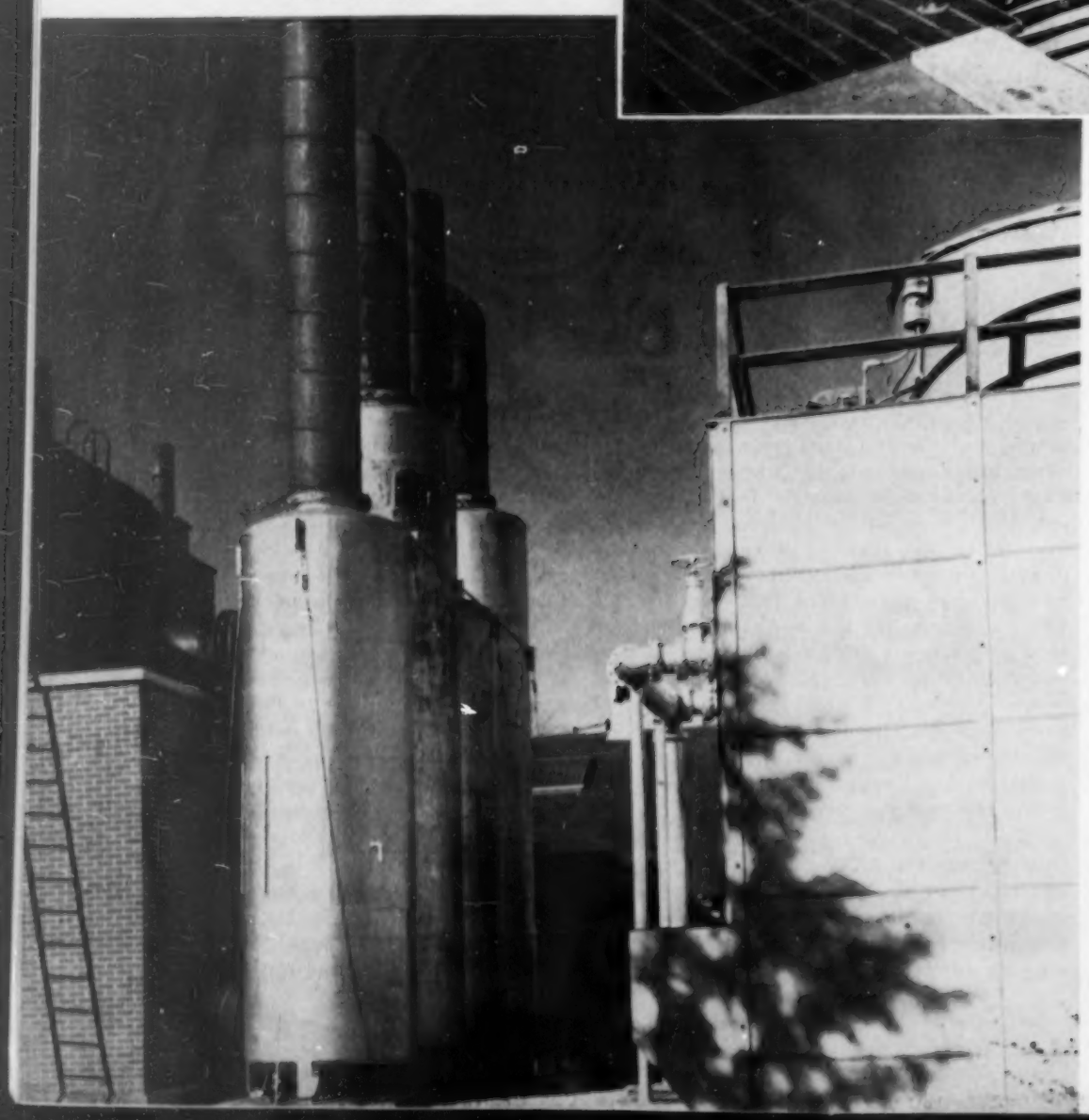
gross total of 24,321,300 kw hrs. At the same time, despite relatively poor load factors, these F-M engines consumed only 1,356,160 gal. of fuel, representing an average of 13.59 kw/hrs/gal of fuel. This helped raise the plant average for all four engines to 13.43 kw/hrs/gal.

Table II indicates the important extent to which the F-M engines influenced the economy of the Bluffton plant during this 19-month period. The table gives the gross kilowatt hours, the rates of fuel consumption, and the average fuel costs of the Fairbanks-Morse diesel engines, as well as of the entire plant. The two Model 31AD18 Fairbanks-Morse diesels are rated at 3500 hp each at 277 rpm and each has 10 cylinders of 18 in. bore and 27 in. stroke. Each drives a 3410 kva, 2500 kw, 60-cycle, 2400/4160-v. alternator, V-belted to a 30 kw exciter.

Fuel oil of 32 grav. priced at 11.1¢ per gal. delivered, is stored in two 25,000-gal. storage tanks above ground, being fed to two 20,000-gal. under-



Exhaust gases from the F-M and Nordberg engines are expelled through these four vertical Burgess-Manning exhaust snubbers.

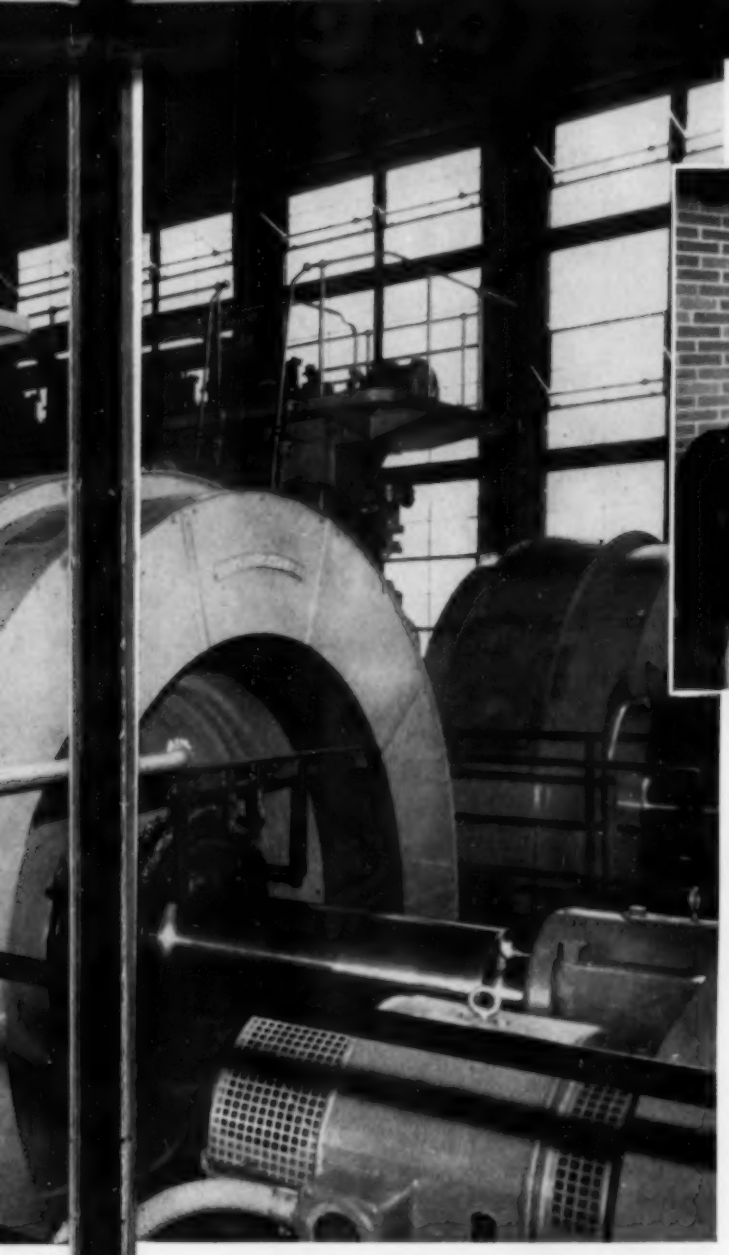


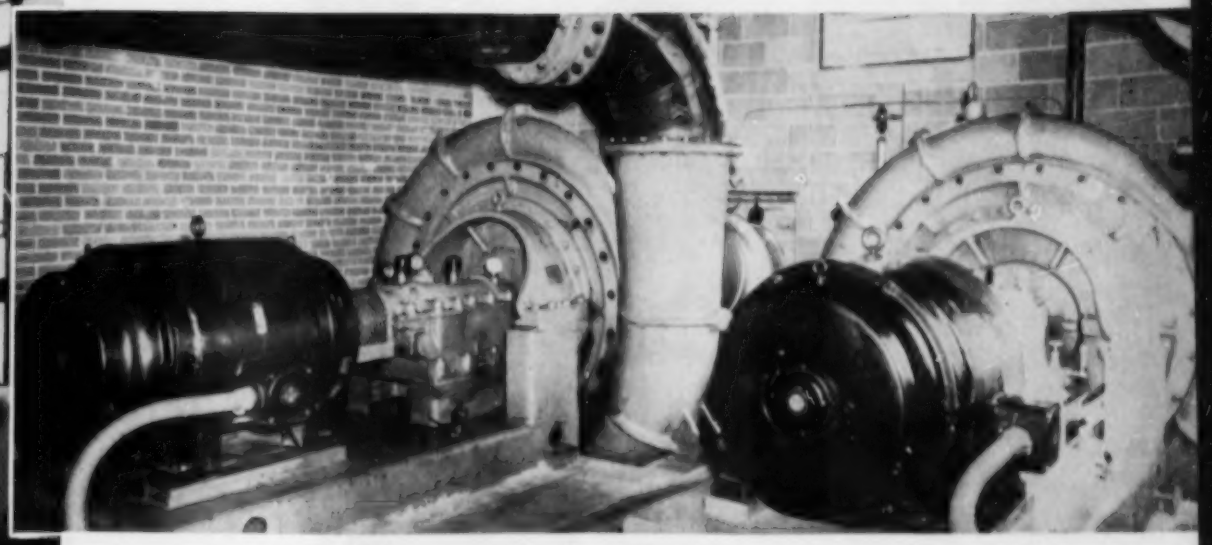
Engines, generators and alternators are Fairbanks-Morse. They are equipped with Madison-Kipp lubricators, Nugent duplex fuel filters, Woodward governors.

ground storage tanks as needed. From these tanks the fuel is drawn through large dial-type meters to a pair of 600-gal. day tanks which serve the two Fairbanks-Morse engines. These day tanks, located in the plant's basement, are equipped with individual level gauges and level controls. The heavy-duty, high-detergent type lube used is kept in excellent condition at all times by a pair of 12-element, cellulose-packed filters. These filters receive lube from the engine sumps and return it to the sumps when it has completed its circuit.

A single gauge board, equipped with push-button controls for the cooling tower fans, the blower motors, the jacket and raw water pumps, and the before-and-after lube pumps, serves both Fairbanks-Morse engines. Also installed on this board are two multi-point exhaust pyrometers, alarms on lube and jacket water pressures and temperatures, and a complete set of gauges on the following: lube pressure and temperature; jacket water pressures and temperature; raw water pressure; and scavenging air pressure. The gauge panels and most auxiliaries serving the four engines in the Bluffton plant are installed in a low basement.

In operating the Fairbanks-Morse engines, Harley Mosure, chief engineer, tries to balance them as





These 24-in. Roots-Connersville centrifugal blowers supply scavenging air to the cylinders at 2.86 psi. They are driven by two 300 hp F-M induction motors.

much as possible, rather than using one as a base-load engine and the other as standby. By running one for a week and then switching to the other, he can be sure that both are in top condition and ready for service. A normal 24-hr. schedule runs like this: from midnight to 5 a.m., the two small engines (total capacity 2000 kw); from 5 a.m. to 7 a.m., one Fairbanks-Morse (2500 kw capacity); from 7 a.m. to 9 p.m., one 3500 hp and one 1400 hp (3500 kw capacity); and from 9 p.m. to midnight, one Fairbanks-Morse (2500 kw capacity). The 1400 hp diesels generally carry the light Sunday load.

It will be seen from Table II that the big engines carried 76% of the load in 1953.

Immediate responsibility for the Bluffton plant lies with your author who is City Engineer and Superintendent of Utilities. Ultimate responsibility, of course, rests with Mayor H. H. Robbins and with the City Council, including the following councilmen: Carl O. Shelley, also a member of the Board of Public Works and Safety; Nathan Maddux; Earl Frydack; Charles Decker; Raymond Mosure; John H. Edoris, also City Attorney and a member of the Board of Public Works and Safety; and E. M. Arnold, also City Clerk as well as Secretary-Treasurer of the Board of Public Works and Safety. It was this group of men which decided on the conversion of the municipal plant from steam to diesel power and on the installation of the two F-M diesels. The considerable savings which have resulted and are being returned each year to the city treasury and to the citizens of Bluffton can be attributed directly to their initiative and foresight.

List of Equipment

Engines—(2) Fairbanks-Morse Model 31AD18, 10-cylinder, 18 in. bore and 27 in. stroke, 2-cycle diesels developing 3500 hp at 277 rpm.

Generators—(2) Fairbanks-Morse Type TGZO, 3410 kva, 2500 kw, 3-phase, 60-cycle, 2400/4160-v. alternators with v-belted 30 kw exciters.

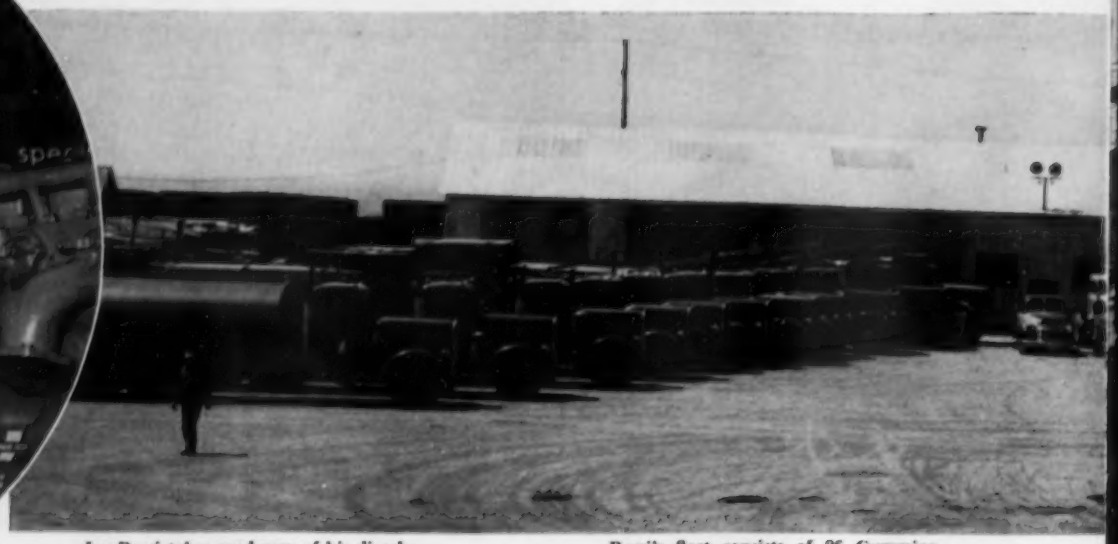
Governors—Woodward.
Scavenging air blowers—Roots-Connersville.
Air filters—Air-Maze.
Air intake and exhaust snubbers—Burgess-Manning.
Fuel oil—Shell.
Fuel oil meters—Buffalo Meter.
Fuel oil filters—Nugent.
Lube oil—Shell.
Cylinder lubricators—Madison-Kipp.
Lube oil coolers—Ross.
Lube oil by-pass valves—Powers.
Before-and-after-lube pumps—Roper.
Lube oil test kit—Guerin.
Cooling tower—J. F. Pritchard.
Heat exchangers—Ross.
Jacket water by-pass valves—Powers.
Day tank level gauges and controls—Rochester.
Gauge panel—Eseco.
Exhaust pyrometers—Alnor.
Gauges—Marshalltown.
Switchboard—Westinghouse.

Two engines are served by this compact Eseco gauge panel. It includes a pair of Alnor pyrometers, and a full set of Marshalltown gauges.

TABLE II

Month	Kw. Hrs. Generated F-M	Kw. Hrs. Generated Total Diesel	Gal. Fuel F-M	Gal. Fuel Total Diesel	Kw. Hrs./Gal. F-M	Kw. Hrs./Gal. Total Diesel
Oct. '52	766,400	1,207,600	55,270	88,400	13.86	13.66
Nov.	679,600	1,210,600	49,155	88,875	13.82	13.62
Dec.	881,400	1,391,700	63,933	102,345	13.78	13.59
Jan. '53	1,147,000	1,396,800	83,318	102,138	13.76	13.67
Feb.	1,061,500	1,241,400	77,177	90,897	13.75	13.65
Mar.	1,128,500	1,317,600	81,551	95,651	13.83	13.77
Apr.	1,042,000	1,253,700	75,118	90,898	13.87	13.79
May	939,000	1,181,900	69,109	87,509	13.58	13.50
June	963,000	1,159,300	72,204	87,304	13.33	13.27
July	739,000	1,148,000	56,214	88,334	13.14	12.99
Aug.	718,000	1,176,000	54,808	90,878	13.10	12.94
Sept.	820,000	1,232,000	60,238	92,338	13.61	13.34
Oct.	863,000	1,269,100	61,959	94,109	13.93	13.48
Nov.	903,000	1,276,400	65,720	94,910	13.74	13.45
Dec.	1,167,000	1,453,200	85,316	107,626	13.67	13.50
Jan. '54	1,176,000	1,424,700	87,355	106,795	13.46	13.34
Feb.	1,052,000	1,275,400	78,140	95,830	13.46	13.30
Mar.	1,263,000	1,425,600	94,205	106,915	13.41	13.33
Apr.	1,125,000	1,280,300	85,390	98,100	13.15	13.05
Totals	18,434,400	24,321,300	1,356,180	1,809,180	13.59 (av.)	13.43 (av.)

Joe Rossi takes good care of his diesels, and they take good care of him. Born in Italy, he won independence the hard way, is now a top logger.



Rossi's fleet consists of 26 Cummins-powered rigs—Autocars, Kenworths, Peterbilts and one Federal tow truck. His shop is in background.

MINUTES ARE PROFITS TO THIS LOGGER

Infinite care in the maintenance of equipment and meticulous recording of how that equipment is handled have meant the difference between profit and loss for Joe J. Rossi & Co., Inc., a Fort Bragg, Calif. logging firm. Most United States business firms operate on a year-around basis and have the opportunity of recapturing in succeeding months any loss suffered because of temporary conditions in previous months.

"That's not true of this business, however," declares Joe Rossi, who came to this country as an immigrant boy from Italy. In the typical American tradition he built up a successful company. "In our operation," Rossi explains, "every penny must be made in the comparatively short seven or eight months of summer. Every minute that our equipment is not on the road in use means a hazard to profits. Trucking the way we do, in an almost day and night operation, our diesel engines and our rolling stock have to be kept in top shape around the clock and we have to keep track of every penny, otherwise we'd end up losing our shirts."

Rossi is one of the few truck operators who has bucked the trend to cut down record-keeping and report forms. He has made record-keeping work for him,—made it pay off in lower maintenance costs, increased efficiency, and greater profits. His 13-year-old firm operates a fleet of 26 Cummins-powered trucks in off-highway hauling of logs over private roads which Rossi helped to build and which he maintains. He also does on-highway hauling of lumber.

Rossi's fleet consists of a 1940 Peterbilt 200 hp. logger which is #1 truck; a 165 hp. Peterbilt logger; two 300 hp. Peterbilt lumber rigs; two 200 hp. Peterbilt sprinklers. He has 14 Kenworths as follows: five 275 hp. loggers; one 200 hp. logger; two 300 hp. loggers; five 200 hp. lumber rigs; one 300 hp. lumber rig; and a 200 hp. sprinkler. He owns five 275 hp. Autocar loggers; and one 165 hp. Federal tow truck. This gives Rossi a fleet of two 165's, 14 200's, five 275's and five 300's, in addition to several spare Cummins diesels, on which he has standardized. With this equipment, Rossi hauls as much as 300,000 ft. of logs 25 to 30 miles each day, as well as 60,000 bd. ft. of lumber transported to distant points.

Fort Bragg, located on California's rugged sea coast, is a major lumber center in the heart of one of the most productive remaining timber areas in the country. Rossi began his trucking career there in 1941, hauling exclusively for the Union Lumber Co. Seven years later, in 1948, he incorporated as Joe J. Rossi & Co., Inc. From the start, Rossi has used diesel power and has insisted on top grade maintenance to keep his equipment in condition for the rugged work it must perform in rough country. In 1949, in order to provide the best possible maintenance facilities, Rossi built a modern shop and added even more room in 1952, along with a compact office nearby. In 1953 he formed a partnership with Les Anderson, an experienced tire dealer, of Fort Bragg and constructed a tire-recap shop in one corner of his seven-acre lot.

In order to come as close as possible to a point that would guarantee the corporation against "losing its shirt", Rossi and H. H. Campbell, his office manager, developed a simple but accurate and comprehensive system for keeping track of the use of all equipment. Campbell, whose background is as interesting as that of Rossi, was a musician and member of a famous "name" band until he decided to take up bookkeeping and accounting. He spent several years in Los Angeles and then went to Fort Bragg where he took a job out in the woods, working for Rossi. When Rossi discovered that Campbell had accounting experience, the one-time musician became office manager and the two began the "process of evolution" from which has come one of trucking's finest methods of record-keeping.

"Although experience dictates the specific changes which must be made," Campbell says, "our method can be used by any trucker or operator of diesel-powered equipment . . . and will pay cash dividends in greater profits. We keep all of our records in tabulated form, and we insist on narrative reports being made immediately after each over-haul. Both the tabulated and the narrative reports are typed and filed in individual folders which cover the life-history of each truck and engine. These folders are retained until we dispose of the equipment. We can tell at any minute exactly what has happened to each and every part of a truck or engine during the entire time we've had it."

Rossi contends that good road maintenance is a major factor in the life of heavy equipment and therefore he expands a lot of time and care on the roads over which his trucks travel. In the spring of 1954, he took delivery on an Adams 660, "the world's most powerful motor grader." It is powered by a Model HRRB-6 Cummins diesel governed at 1800 rpm. and rated at 165 hp. The grader has eight speeds forward and four in reverse. Rossi's shop extended the 12 ft. blade to 14 ft. His operator is able to maintain 31 miles of logging road on weekends with this fast, powerful new machine. He uses two Caterpillar #12 power graders and two water trucks which have 4000 and 4500 gallon capacity tanks.

Since he started logging 13 years ago, Rossi has hauled almost exclusively for the Union Lumber Co., Fort Bragg,

Rossi believes time spent in road maintenance is money saved in equipment costs. This big, powerful Adams road grader enables him to maintain 31 miles of logging road on weekends.

Photographs courtesy Watson & Meehan.

Meticulous Records and Careful Engine Maintenance Helped Joe Rossi, Italian Immigrant, Build Efficient Diesel Fleet Within 13 Years

By KENNETH R. MacDONALD

The Rossi machine and welding shop is equipped with a 20-in. lathe, a drill press, 14-in. power hacksaw, and two welding machines. There are three stalls for repair work, with an overhead hoist on a traveling monorail in each stall. The engine room has a modern diesel engine stand and tools. The pump and injection room is sealed to keep it free of dust and dirt. A well-stocked parts room is adjacent to the tire storage and mounting room. Lubrication is handled in a closed end of the Rossi shop, with air-operated equipment and a well-lighted pit which has an overhead hoist used to remove trailers for servicing. A 1000 gallon underground tank is used for drained crankcase oil.

The Rossi repair shop, under the supervision of Roy Drake, parts manager and trained mechanic, assigns its own number to each tire,cylinder head, super-charger, fuel pump, transmission and axle that comes into use. A detailed record is kept of every trip made and of every overhaul. This record includes an itemized listing of parts which were used and of the amount of labor involved in the overhaul. In addition, the shop keeps a record of the mileage on each tire. Tires are recapped before the tread begins to fade.

Calif., into whose pond one of his Peterbilts was photographed as it was unloading.

Each truck in service gets a full inspection every night from a night crew consisting of a foreman, eight mechanics and two lubrication men. A lube job every other night is standard for each truck, with the odd-numbered trucks lubricated one night, the even-numbered the next. Rossi's maintenance care extends to the batteries which are checked once each week. Engine valves are adjusted after every 2000 miles. Engines are given a major overhaul after 16,000 gallons of fuel.

Behind this extensive maintenance program is the Rossi record-keeping system "which actually doesn't take as much time as most men use to carefully fill their pipes for a smoke," according to Campbell. Each driver makes out a daily report. This report includes the driver's name, the number of his truck, the date, the location of the truck (Rossi hauls from five different sites), and the number of trips made. Also entered is time spent at the landing, the dump, and the scaler's shack. Using these daily reports, the truck dispatcher (between 5 and 8 a.m. each morning) prepares a daily time sheet which is on Campbell's desk when the office manager arrives at work. From this time sheet Campbell makes up his record of the daily use of each truck and this record is entered in the proper truck folder as a permanent record.

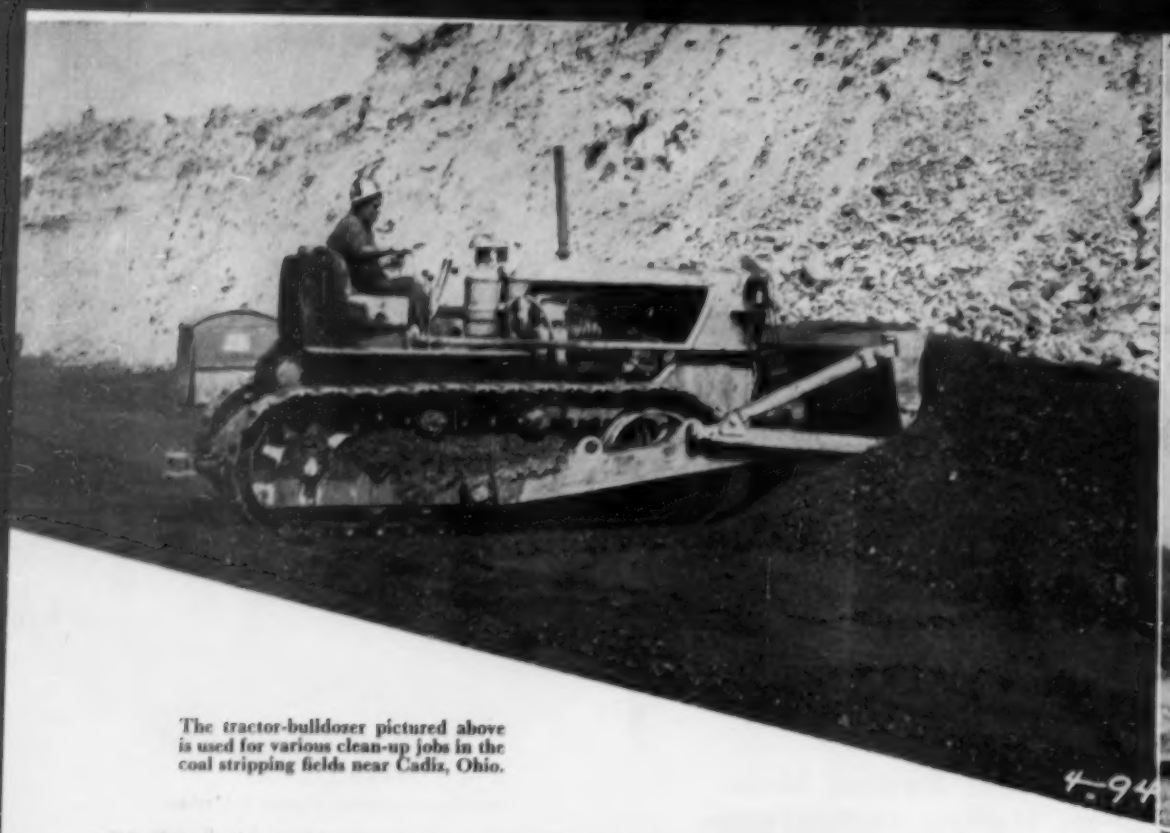
A scale record is also kept, separately, and indicates the number of trips each truck makes daily and the number of hours required for each trip from each location. Out in the shop, the crew makes out a daily service report which lists every item of work done on engines or with respect to fuel, lubrication, differential and transmission greasing or overhauls. Information from these daily reports is transferred to individual engine reports which also are kept in the truck record book. The question might well be asked, "how does all this record-keeping justify itself?" The answer comes quickly from Campbell who has complete responsibility, tax-wise and corporation-wise, for seeing to it that the corporate shirt is kept where it belongs.

"Through these reports," Campbell asserts, "we are able to control our profits by controlling our losses. For example, one single report form covering our lumber trucks might produce the following information: In a specific month, five trucks made 103 trips for a total of 1429½ hours of operation and 33,077 miles of driving, with a total revenue of $15,063.34 and a per mile revenue of .4564 and per trip revenue of $146.25. These figures might vary from month to month and be different for different trucks, but our reports set a pattern for us. Whenever they begin to indicate something outside the pattern, we can take immediate steps to control the situation and clear up the trouble".

Rossi's year-around payroll averages about 25 men, with as many as 45 at work during the seven to eight months of the logging season. At all times, between 7 and 17 mechanics are constantly at work in the maintenance shop. When the mechanics are not at work overhauling equipment, they put their ingenuity and skill to the construction of improved logging equipment.

"We build our own trailers," Rossi explained, "getting our structural steel from Reliance, cut to size for framing. Then we buy the parts and do our own assembly work. We make our own castings to beef up the weak points. Our mechanics have saved us lots of money by devising equipment which we couldn't buy. A good case in point is a rubber bushing which Roy Drake developed to use with the trunion shafts and spring saddles which we designed and built in the shop."

Rossi trucks also use a fifth wheel which was designed and built by Drake, using a "built in" grease seal which forces grease up and out over the face of the fifth wheel. Instead of a bunk pin in the center which takes the thrust, Drake designed one with a tapered cup and cone in the casting. The cup and cone take the thrust and the bunk pin floats inside the cup and cone. There is no shearing off of the bunk pin, due to stress. The shearing action instead is taken up by the cup and cone.



The tractor-bulldozer pictured above is used for various clean-up jobs in the coal stripping fields near Cadiz, Ohio.

DIESELIZED STRIP MINING

By DOUGLAS SHEARING

THE use of scrapers, tractors, bulldozers, rippers, motor graders, wagons and trucks in strip mining coal has resulted in the recovering of more coal from a given area at more tons per man hours than in underground mining. This has been the fastest growing phase of the coal mining industry in the past two decades. Both the crawler and rubber tired tractors and the bulldozer have proved to be particularly versatile in coal strip mining operations. All of these have played a major role in the success of this method of mining. These tools are often used exclusively in the removal of overburden and are being accepted more and more as auxiliary equipment in operations where large shovels and draglines are used for the removal of overburden and the loading of coal. Strip mining methods have shown tremendous advancement in the past 50 years.

Following are a number of uses and possibilities of the scraper in coal stripping operations. 1. The scraper is used in auxiliary stripping where the overburden is so thick that the wash of earth must be removed to allow the boom equipment to work within its economical limits. 2. In cases where there is inadequate spoil room for boom tool operations, that is, where coal outcrop is bothered by property lines, highways, railroads, pipe lines, overhead power lines and undivertable streams, the over-burden must be moved for a width which will provide sufficient space for the spoil of the next succeeding strip cut by the shovel. 3. Widening a bench at the side of the pit to provide greater casting area for the shovel or dragline. 4. Stripping wet top layers of earth which might sluff and cause slides into a shovel cut. 5. Cutting the initial box cut, depositing the spoil out of the way of later drag operations. 6. Use on small or isolated blocks of coal that do not warrant the expense of the movement of a large dragline. 7. Particularly adapted to hillside and hilltop operations. 8. Cut new beds for temporary or permanent stream diversions. Build dams and settling ponds. 9. Build railroad and truck haul road grades. 10. Construction and maintenance of ditch lines. 11. Grading for buildings around mining site. 12. Disposal of refuse. 13. Stock piling of coal when sales are slow. Can lay coal in layers and compact. 14. Can be shovel loaded and used as a coal hauler. 15. Extremely economical in mining small productive plots in widely scattered fields or isolated areas. 16. Stripping overburden and spreading it evenly, reducing back-filling time.

The tractor-bulldozer can easily be called the "jack-of-all-work" in the coal stripping fields. The bulldozer is used in applications ranging from uprooting and windrowing trees and shrubs preparatory to stripping operations to loading and unloading heavy machinery. Other applications which make the bulldozer an economical member of any stripping operation includes: 1. Leveling paths and cleaning area for walking draglines and shovels. 2. Road building and maintenance and miscellaneous grading work. 3. Positioning railroad cars for loading. 4. Reclamation and backfill operations. 5. Cleaning the

A bulldozer removing overburden in a rugged Canadian Rockies mining operation in Alberta, Canada.

top of the coal seam before loading. 6. Adaptable for hillside and hilltop operations.

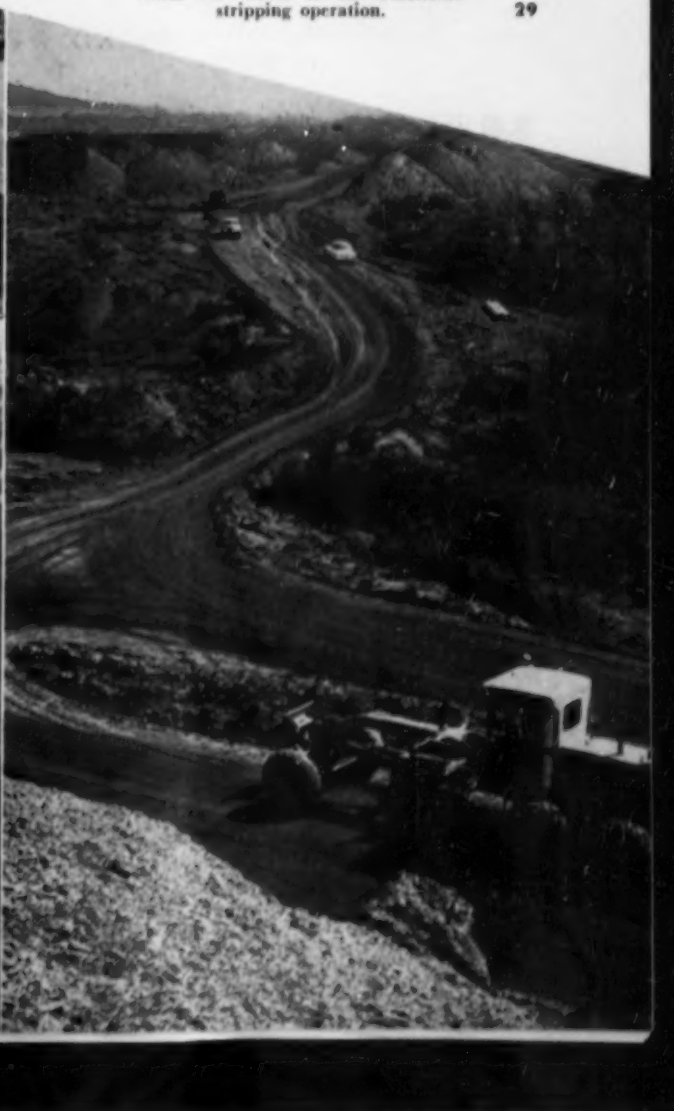
It's an accepted fact that where applicable, the large capacity shovel and dragline is more economical, but the extent of the coal field, the per cent of slope of the overburden and available capital of the operators are some of the factors which govern the use of other equipment. For the medium to small size stripping operator, the use of scrapers and bulldozers is ideal in the outcrop and contour stripping in rolling or hillside country, where it is desired to haul spoil away from the mining area. Scrapers used under these conditions usually range from 10 to 20 cubic yard struck capacity, drawn by either crawler track or wheeled prime movers of 80 to 225 hp., usually push loaded. Naturally, the length of the round trip depends mostly on the lay of the land and the amount of spoil to be wasted. Experience has shown that it is best to hold the round trip distance to around 600 ft.

The medium to small size stripping contractors are often faced with the refusal of a farmer to work his land for fear it will not be restored to its original worth. State laws governing the reclamation of stripped-over lands are becoming more strict, with severe penalties for nonfulfillment of regulations. Because of the type of earthmoving equipment available today for strip mining operations small leasers are able to offer landowners attractive contracts to work their land. Restoration, through the use of scrapers and bulldozers, of stripped-over lands to nearly the original contour is an inducement to the farmer owner of coal land. The 16 to 24 in. of top fertile soil are first removed by scraper and stored at an out-of-the-way site. The remaining overburden is removed by scrapers and bulldozers by the ordinary method of procedure. After the area is mined out, the spoil is spread over the land approximately conforming to the original contour of the land. The fertile top soil is then spread over the level spoil.

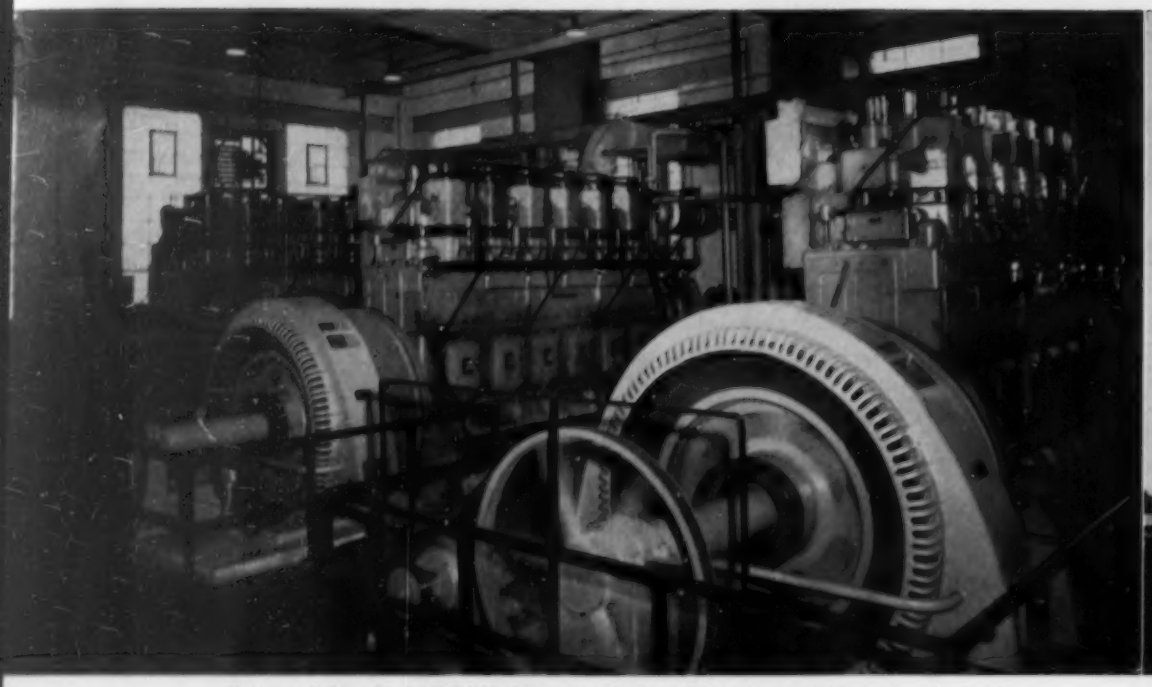
Many operators in the anthracite country use scrapers in their fields to remove the earth down to the rock strata. The rock is removed to the economical dragline or shovel height by shovel or drag loaded trucks. Haul distances are often considerable compared with spoil haul distances in the bituminous fields. The scrapers run 14 to 20 cubic yard struck capacity, while the rock wagons favored appear to be rear dumps up to 50 ton capacity. The rubber wheeled two wheel prime mover, with rear dump rock box used by some strip contractors, seems to hold its own against the orthodox load-over-back truck. It is claimed by many contractors who have used both, that the scrapers move earth at much less cost than shovel loaded trucks.

This Caterpillar bulldozer is used for building haul roads, cleaning top of coal seam and cutting drainage ditches in the soft coal stripping operations near Bokoshe, Okla. The giant dragline is a Bucyrus-Erie.

A scraper being pusher loaded to remove overburden in coal stripping operation in Pennsylvania.



A motor grader maintaining haul roads for trucks in an Oklahoma stripping operation.



Battery of three Model D8Q-36 Enterprise diesels in REA plant provides power for large Florida agricultural area around Moore Haven.

Side entrance of plant. In rear of building are three Maxim silencers and three American Cycoil air filters.

REA PLANT HELPS DEVELOP FERTILE FLORIDA INTERIOR

Survivor of Flood, Fire and Depression, Glades Electric Cooperative Thrives With Extensive Area It Serves

By ED DENNIS

MOORE Haven, on the shores of Lake Okeechobee, is a youth among Flordia communities. Incorporated in 1917, it almost died as a town during the 1926 hurricane and flood. But that was yesterday. Within the last few years, Moore Haven has become an attractive city — county seat of Glades. Of all the 67 Flordia counties, Glades has the largest per capita income and has no bonded debt, according to Carr Settle, publisher of the Glades County Democrat.

The enviable financial position enjoyed by Glades County is due to a considerable extent to its efficient REA power plant. But the Glades Electric Co-op means much more to the community it services than financial stature. Of utmost importance is the fact that Moore Haven is located in the hurricane belt and MUST feel secure in having 24-hour electric service. Thousands of persons, and hundreds of drainage canal pumps, are dependent on this REA power station.

The cooperative plant is unique in another respect. About 15 miles away, in Clewiston, is the United States Sugar Corporation. (See "Raising Cane in Florida," DIESEL PROGRESS for October, 1953.) The Glades Electric Co-op has an inter-change power agreement with this largest raw cane sugar firm in the U.S. The REA plant buys power from the mill when it is operating and sells power during sugar's off-season. The power purchased from the co-op is needed in the extensive repair shops of the mill, and by the city of Clewiston. This interchange agreement is mutually profitable. The mill can produce power inexpensively because it burns dry cane fiber, mixed with a small amount of bunker C oil. This keeps the cost of running the steam generator plant at a competitive level with diesel-generated electricity.

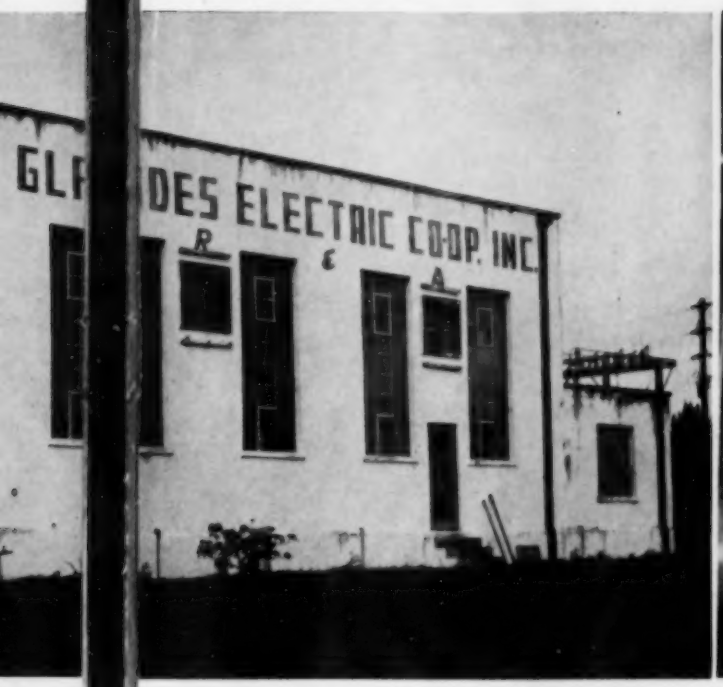
Moore Haven got into the municipal power business with a 1-cylinder De La Vergne diesel generating set that operated only from 4 to 7 a.m. and from 6 p.m. until midnight. The town made this tiny plant do until 1920 when the city fathers decided to purchase additional equipment. They installed a 50 kw. Fairbanks-Morse unit. The new diesel-generator had to be barged up the Caloosahatchee river from Fort Myers due to the lack of a railroad. The plant then went on a 24-hour basis. In 1924, the De La Vergne was replaced with a second Fairbanks-Morse. The two engines served until the 1926 hurricane hit the area. Tons of water from Lake Okeechobee were dropped on the town, drowning nearly 150 persons and knocking out the power plant.

As soon as the water receded, the diesels were dismantled, cleaned, reassembled and put back into service. But in 1930, the power plant was destroyed by fire. The depression had hit the country, and Moore Haven was broke. Nevertheless, city officials had faith in a power plant of their own. They entered into an agreement with Fairbanks-Morse to buy a new generating set and to pay for it out of revenue. This arrangement worked out mutually satisfactory. Fairbanks-Morse sold an engine despite the depression and not a single payment on it was missed. Moore Haven, for its part, gained both electric power and a source of revenue, and also established a credit rating of A1.

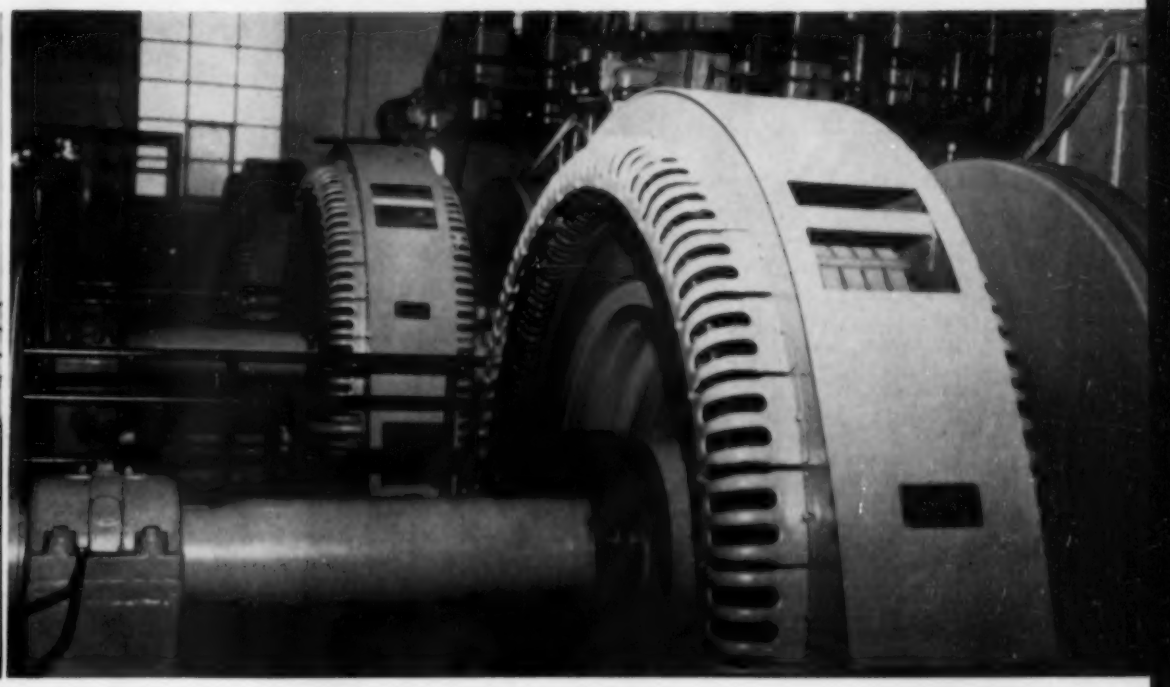
Glades Electric Cooperative, Inc. was formed in 1946. It took over the Moore Haven plant with its Fairbanks-Morse engines of about 180 and 150 hp. But as the new REA was also to include the surrounding country, officials quickly obtained two mobile units. Each was an International diesel on a 50 kw. Ready Power generator.

The post-war influx of people prompted the board of directors to buy additional equipment in 1948. This brought the first two of three turbocharged Enterprise DSG-36 diesels into the plant. Thereafter, the co-op was able to provide power for all on the waiting list. Total consumers reached nearly 500. Since the two new Enterprise engines were able to carry the existing load, the other engines were removed and sold.

The transformation of the vast semi-tropical wilderness surrounding Moore Haven into an empire of cattle raising and other agricultural pursuits is one of the great stories of Flordia. Thousands of acres of extremely fertile land were developed. The power lines of the Glades Co-op expanded for about 450 miles to the cattle ranches in the Okaloacoochee Slough and across the Seminole Indian reservation to near the Sebring city limits. Confronted by this demand for power, the board of



Also seen is a 7½ hp. Layne pump of 300 gpm. capacity. Three of these are connected to common headers.



Diesels turn three Elliott 840 kw. generators with GE belt-driven 15 kw. exciters. Drainage canal pumps are dependent on this installation.

directors decided in 1952 to purchase a third turbocharged Enterprise.

These three units gave the Glades plant 3600 hp. and a generating capacity of more than 2500 kw. Three engines also give the plant considerable flexibility to meet various load demands. In its 1953 report, the co-op showed peak loads of 2050 kw. and an annual fuel consumption of 313,318 gallons. Total kwh. generated were 4,194,000.

Fuel oil used is Gulf #2 Dieselect. Its physical characteristics are: gravity, 38.7; flash, 158; color, 1.0; sulphur, 0.10; end point, 640; cetane number, 54; viscosity, 2.77; analine point, 159.8. The plant has three storage tanks with total capacity of 35,000 gallons.

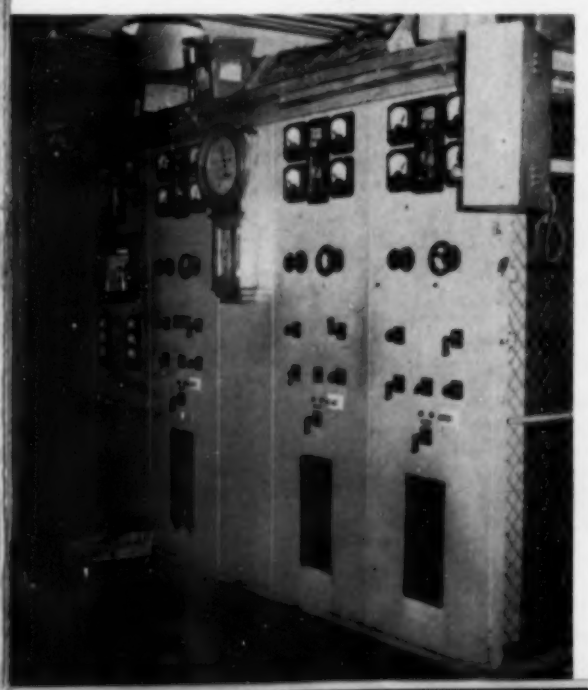
W. B. Irby, Jr., the Co-op manager, says the three engines run an average of 10,865 hp.-hrs. per gallon of lube oil. He uses Gulf Dieselmotive A in the upper cylinders and Parvis M in the crankcase and turbocharger. The plant uses vacuum, heat, activated clay, and mechanical filtration to combat dilution and contamination. Mr. Irby says this careful system is very effective. The oil is batched every month,—oftener if it needs it. The plant superintendent, H. C. Keenan, has not changed oil in the last three years. He and Mr. Irby are convinced that good oil filters, strainers, and reclaimers pay off. Heat exchangers are used in the system to keep the oil at correct temperature.

The plant has adequate cooling water for the three diesels. There are three 45-ft. raw water wells, each with a 7½ hp. large-bowl turbine pump rated at 300 gpm. All are connected to a common header so that one or all can be used. The discharge water goes into a small lake back of the plant which serves the city as a bathing beach. In addition to the well pumps, a stand-by pump draws water from the lake into the common header.

Because of the exchange agreement with the sugar corporation, the engines have not accumulated a terrific number of hours. Since they are shut down approximately six months annually, they are easily maintained in top condition. The records showed that up to November 2, 1954, No. 1 engine had 21,343 hrs., No. 2, 18,498 and No. 3, 11,249. The record also revealed that in 1949 the engine maintenance per kw., including parts, was $2.23. Five years later, in 1953, this figure had dropped to $2.09 although the load had increased more than a million kw. in the meantime.

Officers of the Glades Co-op are Richard Archbold, president; J. E. Frierson, vice president; and Stanley Wayman, secretary-treasurer. They are quick to give Mr. Irby and Mr. Keenan credit for the highly successful operation of this plant.

General Electric switchboards and instruments are protected against short circuits by a percentage differential relay.



List of Equipment

Engines—3 Enterprise DSG-36 diesels, rated at 1200 hp., 16-in. bore, 20 in. stroke.
Generators—3 Elliott 840 kw.
Exciters—3 General Electric 15 kw.
Turbochargers—2 Elliott-Buchi, 1 Elliott.
Governors—3 Woodward UG8.
Silencers—3 Maxim.
Exhaust pyrometers—Alnor.
Switchboards—General Electric.
Air Compressor—Quincy.
Fuel Oil transfer pump—Potter, 20 gpm.
Fuel oil filters—Winslow.
Air Filters—American Cycoil.
Lubricators—Manzel.
Heat Exchangers—Ross.
Lube oil filter—Honan-Crane model 1430 AH.
Lube strainers—4 Elliott twin SN-42065; and 2 Cuno Auto Kleen type 1430AH.
Oil reclaimer—Hilco model 2 H-1.
Jacket water pumps—4 American Marsh, 300 gpm.
Control Valves—Fulton Sylphon.

YEAR	Kwh. GENERATED	GALS. OF FUEL	PEAK LOAD	AVER. TOTAL PER Kw. CENTS	NUMBER OF CUSTOMERS	*ENGINE MAINT. PER Kw.
1953	4,194,000	313,318	2050	.145	842	$2.09
1952	4,903,000	369,964	2000	.140	767	$1.78
1951	4,326,000	318,985	1700	.132	672	$1.03
1950	3,511,000	293,071	1475	.134	618	$1.00
1949	3,114,000	253,649	1400	.170	564	$2.23

*Includes all parts and labor chargeable to maintenance.

The 94-ft. diesel-electric *Sharon Lee* was designed to tow over the stern at sea; push barges on inland waterways.

SEAGOING "SHARON LEE" BUILT FOR INLAND WORK

Mechling Barge Lines Offers Through Water Shipments Between Middle West and Tampa Bay; New Equipment Includes 1200 HP Diesel-Electric Tug

THROUGH barge service between river ports in the Middle West and sea ports in the Tampa Bay area are provided by A. L. Mechling Barge Lines, Inc., Joliet, Ill., since acquisition of the new sea-going tug, M/V *Sharon Lee,* late last summer. The diesel-electric tug has 1000 shp., is 94 ft. long, has a 26-ft. beam and 11-ft.-7-in. depth of hull. Besides being designed for service in both inland and coastal waters, the vessel gives the crew access to all its parts without the necessity of going outside during heavy weather.

Tams, Inc., New York, designed the *Sharon Lee* to American Bureau of Shipping standards for coastwise work. Construction was by Calumet Shipyard & Dry Dock Co., Chicago, for the Cleveland Diesel Engine Division, General Motors Corp. The operating firm, Mechling, has also chartered 12 coastwise barges.

Flat-bottomed twoboats and barges, generally used in the Inland Waterways System, cannot be used, normally, to cross the Gulf of Mexico. There is a constant threat of heavy seas that would damage, if not sink, such craft. In contrast, the *Sharon Lee,* has a vee bottom and the hull is divided into six watertight compartments. Also, heavier steel plates were used in the hull,—½ and ⅜ in. Frames are 5x3x⅜ in., and deck plating is 5/16 in. The barges, also of heavier steel than is used for inland units, can be tightly sealed.

Cargoes available to the Mechling Barge Lines in the up-river ports of the Mississippi and Illinois will include grain and grain products and by-products; soybeans and soybean products and by-products; iron and steel. Return cargoes from Flordia consist largely of triple super-phosphate and phosphate rock. Since, with the new equipment, it will no longer be necessary to transfer cargoes at New Orleans, with the attendant expense, lost time and cargo loss and damage, Mechling officials anticipate that shippers of commodities also may be interested.

Propulsion machinery consists of a GM Cleveland Diesel (1200 hp at 750 rpm.) on the same manufacturer's dc generator (814 kw, 750-v at 750 rpm.) with a GM Electro-Motive propulsion motor.

The *Sharon Lee,* named after the daughter of Mr. and Mrs. Harold G. Mechling, has accomodations for a 15-man crew. Her fuel oil capacity is 22,000 gals., fresh water, 2400 gals. Living quarters, messroom and galley are on the main deck. The captain's quarters are above the main deck and aft of the pilot house. Pilot house and captain's quarters are finished in mahogany, as is the trim and interior doors in the crew's spaces. Otherwise, the latter quarters are insulated and sheathed with Masonite. The pilot house is equipped with a Sperry steering control stand, radar with 8 in. scanner, ship-to-shore telephone, automatic pilot and gyro compass.

The engine room is completely insulated and is sheathed with Johns Manville acoustic materials, finished in white enamel. Heat exchanger and oil cooler are at the forward engine room bulkhead. Two 40 kw GM diesel-driven generators are on the port side, with the main switchboard aft of these sets. Fire, bilge, and fuel oil transfer pumps all are on the starboard side, forward. The main propulsion motor control benchboard is opposite the controls on the main generating engine. The steering gear and towing machine control panel and resistors are located on a platform at the after end of the engine room. A 24 kw auxiliary generator, mounted on top of the main generator, provides for daytime service.

An Almon A. Johnson towing machine is located on the after deck with a special double bitt incorporating wide rollers for the towing cable. There are two 15-ton special winches on the forward deck along with the river boat type deck fittings in addition to regular deck fittings. Thus, the tug can be used for pushing barges in river service as well as for over-the-stern towing at sea.

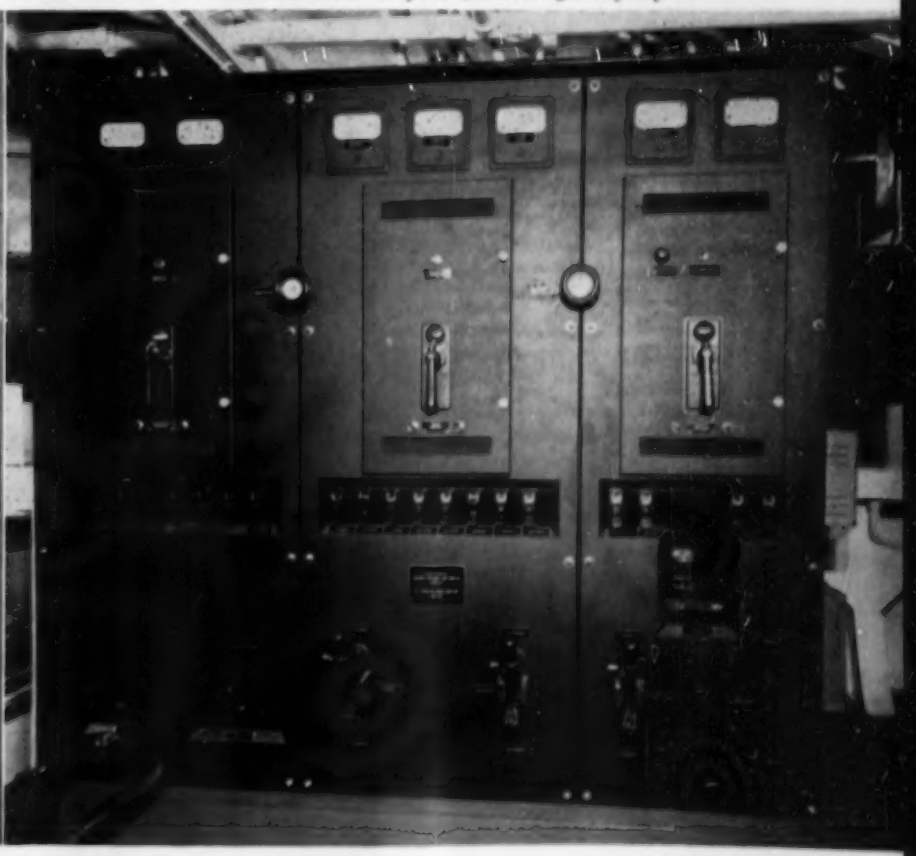
There is a sea chest for main engine cooling. All auxiliary machinery and equipment requiring sea water are supplied from individual sea chests.

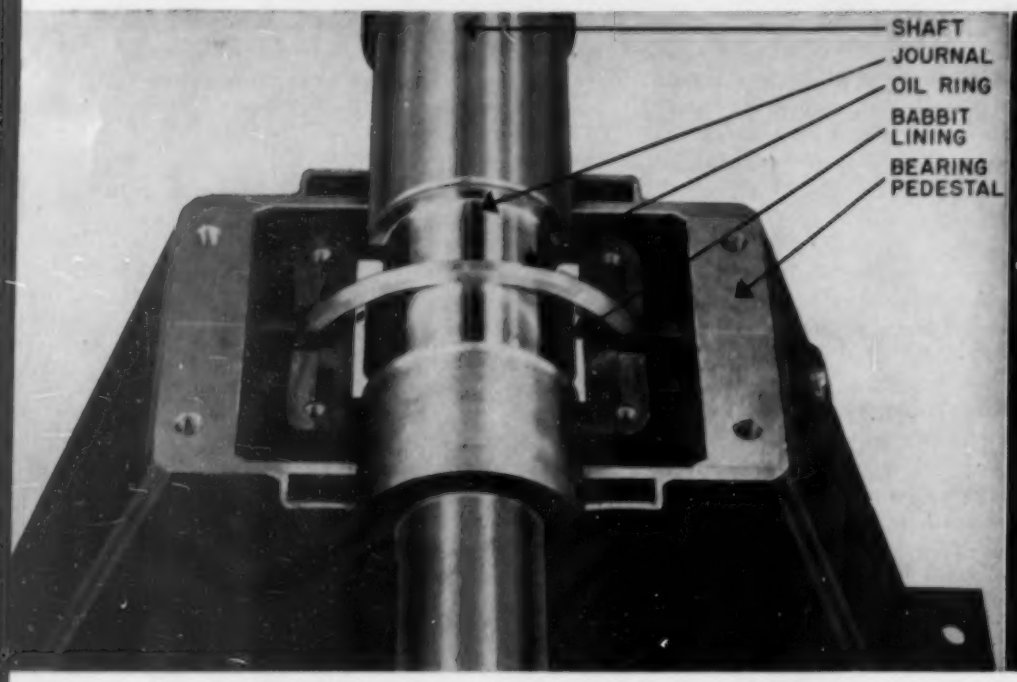
List of Equipment

Engine (main)—GM Cleveland Diesel, Model 12-278A, 1200 hp at 750 rpm.
Propulsion motor—GM, Electro-Motive Division, 1020 hp, 750-v, 1083 amps dc.
Reduction gear—Farrell-Birmingham, 3.99/1.
Auxiliary generators— (2) GM, Cleveland Diesel, 60 hp, 40 kw, 1200 rpm, dc.
Auxiliary generator for main generator—Delco 24 kw, 120-v, 200 amps dc, 1420/2840 rpm.
Main engine MG sets— (2) Electric Products 7.5 hp, 1750 rpm.
Control bench board—Lake Shore Electric.
Air compressor—Gardner-Denver.
Governors (main and auxiliary engines)—Marquette.
Lube oil standby pump—Viking.

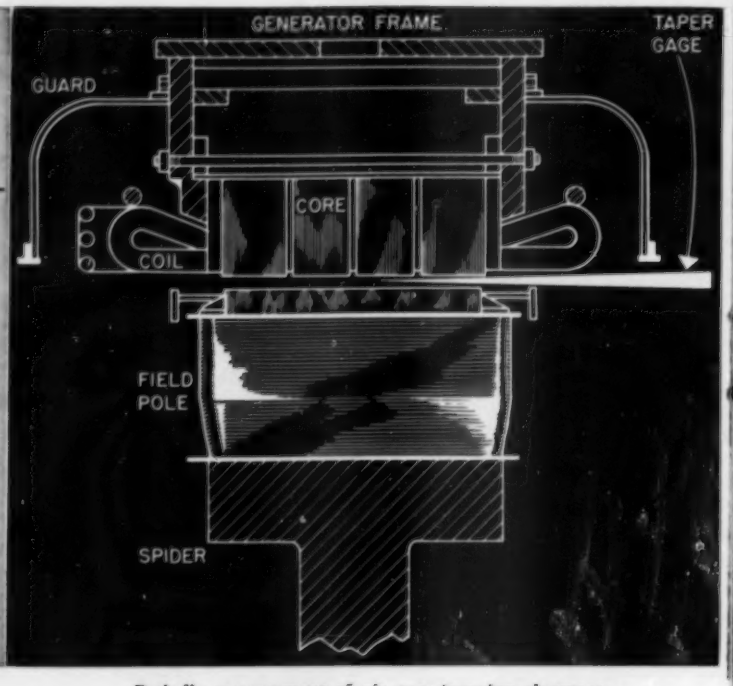
Starboard side of the tug's engine room, looking forward along the 1200 hp General Motors Cleveland Diesel that drives an Electro-Motive propulsion motor. Crew can reach all parts of tug without exposure to weather.

Both the MG control cabinet and the control bench board in the *Sharon Lee* were built by Lake Shore Electric. Accessories include Marquette governors, Gardner-Denver compressor, and Viking lube pump.





Period checking of bearing temperature and condition is recommended. With the bearing cover and the top half of this sleeve bearing removed, the unit can be inspected.



Periodic measurement of air gap (running clearance between stator and rotor) with a taper gauge is necessary to maintain a close check on bearing wear. Insert gauge as far as it will go into air gap. Width of gap can be read from scale on gauge.

GENERATOR MAINTENANCE PREVENTS SHUTDOWNS

IN isolated areas where power plants are not tied in with other power systems, generator failure hurts homes and businesses alike. Loss of power stops pumps, compressors, control devices, electric appliances and lights. Safety, efficiency and capacity to operate all are seriously curtailed unless emergency arrangements can be made or the generator repaired quickly. If neither, then the power plant operator must reckon with the problem.

Obviously, spotting potential troubles before they develop into major breakdowns can save dollars and hours of possible downtime. Simple helps and common sense care will do much to provide continuous, trouble-free service. Routine attention to lubrication, ventilation and cleanliness to the generator and other equipment actually *pays off*.

Electric power has grown to be associated with continuity of service, due in a large part to the integrated networks of the public utilities. Where the network does not exist, uninterrupted power depends on anticipating (thus avoiding) outages. Electrical breakdown is usually a failure of the insulating materials. The traditional enemies of insulation are: (1) high temperatures; (2) moisture and oil; (3) abrasive and conductive dust; (4) corrosive atmosphere; (5) excessive vibration.

Mechanical breakdown is usually a failure of the bearings which may lead to more serious trouble, such as internal damage to the generator. In either sleeve or ball bearings, the imminent bearing failure is accompanied by a rise in bearing temperatures, hence we have a good indication of things to come. Hot sleeve bearings may be the result of any of the following causes: (1) rough bearing journal; (2) misalignment; (3) oil rings not rotating with shaft; (4) bearing load too great; (5) oil too heavy, dirty, or poor quality (breakdown of lubricating properties); (6) improper fitting of babbitt lining at split; (7) end thrust, usually due to improper leveling or incorrect assembly. (Prolonged heavy pressure of the shaft shoulder on the end of the bearing will cause heating.); (8) pitted bearings or journals. (Pitting may be the result of corrosive chemical elements in the oil, or may be caused by shaft currents.); (9) Restricted Ventilation. (A moderate flow of cool air over the bearing housing should be permitted to carry away the heat of friction.); (10) Oil cooler not working. (This applies only to those generators using a circulating oil system with a heat exchanger.)

Ball (or roller) bearings will generally run hot under one or more of the following conditions: (1) Too much grease (churning). This is a common cause of heating, and by destroying the lubricating quality of the grease, may lead to early bearing failure. This is a much worse offender than too little grease. (2) Too little grease. This is the condition in which grease is so low that it fails to get to the rotating balls and retainer. (3) Grease too stiff. The grease must work freely in the bearing and bleed enough lubricant to wet the bearing parts. (4) Contaminated grease. Dirt is the number one enemy of ball bearings. (5) Excessive load (due, for example, to a thrust in addition to normal load). (6) External heat, or blocking of normal air flow around housing. This leads to eventual breakdown. (7) Actual bearing failure. Heating here is from increased friction losses and is usually accompanied also by increased noise.

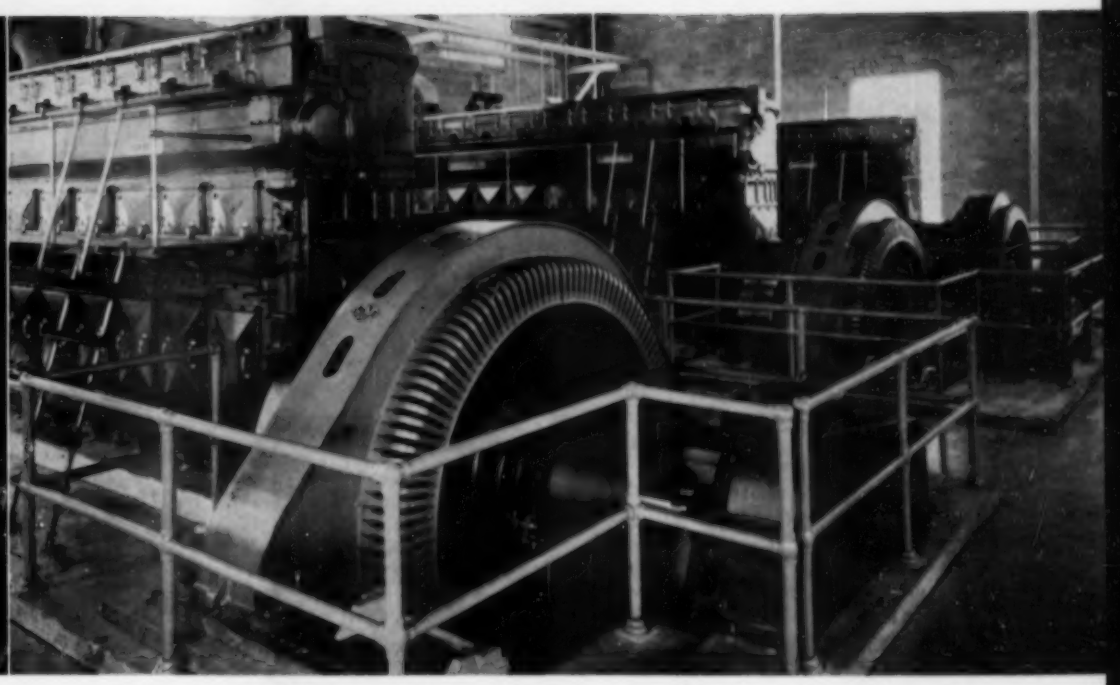
Shaft currents deserve special mention here for they destroy both sleeve and anti-friction bearings. Certain unsymmetrical magnetic circuits in a generator (or motor) cause currents to flow along the shaft, through a return path (brackets, frame, etc.) encircling the stator core, and back into the shaft. When these currents flow in the bearing, they break through the lubricating film, and, by arcing, cause serious pitting of the bearing surface. The generator manufacturer usually provides some form of insulation (often on the opposite-drive-end bearing or pedestal) to break this shaft-current path and it is an important function of station maintenance to see that this insulation is not by-passed by piping, tools, ground wires, etc.

Brushes (and to a lesser extent, commutators and collector rings) are the only other components of a generator liable to wear out physically. For carbon brushes, proper pressure is about three pounds per square inch of brush face. Since many brushes are less than one square inch cross section this will often be less than three pounds per brush.

Routine maintenance can be best performed during normal downtime of the generator. This may be during off-peak periods (when a companion generator is carrying station load) or when the engine is also down for regular maintenance. Periodic checking of lubrication, air gap, and brushes, and replacement of worn parts when necessary can cut outages to a tenth of the number which occur without a planned program. That last 10% is reserved for lightning, overspeeds, and such "unavoidable" trouble which plague all supervisors.

Lubrication is most important, and should be checked at least once a day. Oil level can usually be checked by sight gages; oil ring operation through an inspection hole. Grease-lubricated ball bearings are not so readily checked visually, but their temperatures and noise level provide some

Brushes on exciter are being checked with a simple spring scale. The pressure (force over area) on brush face should be 2 to 4 psi., depending on maker's recommendations.



Maintenance is done best in off-peak hours when one or more of the units is idle. Work done then will minimize costly shutdowns when total output of plant is urgently needed.

Author Outlines Steps for Spotting and Eliminating Potential Trouble Before It Develops

By ROBERT J. KOLAR*

clue to their condition. It should be noted, however, that a bearing housing which feels hot to the touch is not necessarily dangerous; bearings with good grease can run safely at temperatures up to about 180°F, which is uncomfortably hot to touch. The human element can be partially eliminated by the use of monitoring thermometers or relays on bearings. The relays may be used to sound an alarm, or shut down equipment, or both, when temperatures reach too high a level.

Grade of oil or grease is a complete subject itself and not within the scope of this article. Usually, a high quality oil SAE 10 to 20 or a soda-soap grease is used, but in any specific installation the recommendations of the generator manufacturer or lubrication engineers are of paramount importance. Likewise, the time between oil changes depends on local conditions, but in general the grease or oil should be changed and reservoir flushed whenever it gets black or dirty. If no dirt is apparent it should be replaced every six months in average use.

Air gap is the term used to describe the small running clearance between rotor and stator. An intense magnetic field exists in the gap and it is desirable to keep this clearance as uniform as practical around the periphery of the rotor. Bearing wear allows the rotor to drop slightly, reducing the gap at the bottom. Unbalanced magnetic pull is greatest on the side with the smaller gap, so the cumulative effect may aggravate the bad condition to the point at which rubbing of rotor and stator occurs. Air gap may be checked with a tapered feeler gage inserted between rotor and stator at about four points around the rotor periphery. It is important in measuring gap to insert the gage at the center of the rotor poles, not near the pole tips, and measure on a stator tooth, not on a slot insulator. Actual value of air gap is usually not important to the station operator, but uniformity is important. Some generators are made with the rotor offset slightly above center at factory assembly. This offset can be readjusted on pedestal type machines by shims under the pedestal. Amount of offset is usually about .010 in. or about 10% of the air gap.

Brush pressure can be measured effectively by pulling on the brush lever arm (at point of contact on the brush) with a "fish scale" until spring tension is just removed. Scale reading divided by brush area (divided by width times thickness) should be between two and four pounds per square inch or as recommended by the generator manufacturer.

Good housekeeping is a necessary part of good maintenance and involves keeping the air and the surroundings clean and neat. Lubricating oil and grease must be kept clean and uncontaminated. Air passages thru the generator must not be clogged and heat-dissipating surfaces must be kept clean. Avoid obstructions, boxes and partitions within five feet of the generator to prevent recirculation of heated air thru the machine. Oil accumulations should be cleaned up, and oil mist must be kept out of the ventilating passages.

Symptoms of impending trouble can usually be noted by a visual inspection of the generator. Arcing at the brushes is a condition to be checked, for it often indicates insufficient brush pressure which may, in turn, be caused by brushes worn too short. Temperature measurements are good indicators of the condition of both insulation and bearings, and as indicated previously, can be made by automatic monitoring equipment.

Generators on which continuous operation is essential may be provided with spares for normal breakdowns. These spares should include brushes and bearings in every instance, plus varying quantites of stator coils, rewinding materials, field poles, brush rigging, and exciter components. Necessity for rewinding materials depends to some extent on incidence of lightning and the other enemies of insulation mentioned above. The renewal parts section of NEMA (National Electrical Manufacturer's Association) recommends the following quantities of spare parts for maintaining continuous operation: Stator coils with winding supplies, 1/3 set; Rotor field coils, 1 set; Brushholders, 1; Brushholder springs, 2; Brushholder stud insulation, 1; Brush, 1 set; Bearings, 1 set; Oil rings (when used), 1 set; Retainer rings (antifriction bearings), 2 sets.

The above quantities are for stations having one to four generators in operation. Recommended quantities increase slightly when more units are involved. In general, the life of and satisfactory service from a generator can be increased immeasurably by proper care. Just as an automobile requires its gasoline and oil, rust inhibitors and anti-freeze, so must a generator have its lubrication, cool air, and solid foundations to perform effectively. Usually the generator will require far less attention than the automobile we use for comparison. Therefore those of us who care properly for our autos should not find it burdensome or difficult to keep our generators running smoothly. The small efforts required for routine maintenance are repaid many times in peace of mind for station operators, superintendents, and maintenance personnel.

*Mr. Kolar is a mechanical engineer with Electrical Machinery Manufacturing Co., Minneapolis, Minn.

A CIVIL DEFENSE INSTALLATION

DIESEL PROTECTS EL TORO MARINE BASE

By JAMES JOSEPH

THE Marine Corps' air arm flies swift-winged jets. Yet from scuttlebutt going the rounds at California's El Toro Marine air station—biggest Marine air post on the west coast—you'd think the leathernecks were dieselized. For, come that "any eventuality," El Toro's jets will still be operational, thanks to a new 600 kw. Enterprise standby power plant. The engine ties into El Toro's strategic, all-important "emergency circuit"—supplying power for runway lights, control tower and quick-fueling pumps to keep jets in the air.

These are the three essentials for getting fighters airborne, particularly for round-the-clock operations. That's why the squat, reinforced concrete building close by El Toro's flight line has importance far out of proportion to its size. Further, the new Marine standby station is of fool-proof design. Immersion heaters in both jacket water and lube oil lines maintain temperatures 24 hours a day, for quick, 4-second start-up. Special controls automatically "test run" the engine 10 times monthly, graphing performance on a continuous 30-day chart.

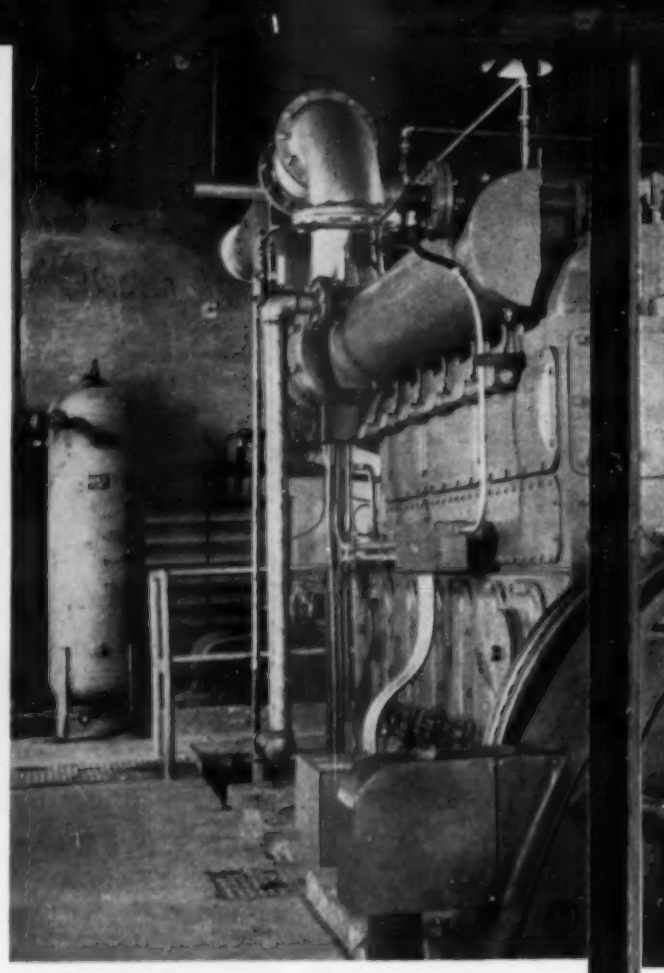
The Enterprise is a model DSG-316, rated 856 hp. at 600 rpm., with a 12 in. bore and 15 in. stroke. The 6-cylinder power package directly drives an Elliott 750 kva., 600 kw. at 600 rpm., ac. generator and an Elliott dc. exciter, rated 7.5 kw., 60 amps. at 1750 rpm. The exciter is belt-driven.

Ray Hogaboom, Enterprise district manager, says: "This is probably the second west coast Enterprise installation with 24-hour standby temperature controls. There's also one at San Francisco International Airport. At El Toro, engine jacket water is kept at 170°f., lube oil at 140-145°. The engine can start, reach load speeds—600 rpm—within an average of 12-15 seconds. In another second it takes over the load."

The procedure, of course, is strictly automatic—should main power fail. "Brain" of the emergency station is a Custom Built Controls console. The console—its relays and timer circuits—is installed on the power house's port wall. (The Marines, whether airborne, afloat or ashore, use Navy lingo.) Integrated into the console is a Bristol continuous (30-day) recording graph. The graph monitors the engine's test run. Above the Bristol are seven indicator lights, each tied to separate control circuits. Normally, controls are pre-set to start the engine every third day, let it run upwards of 10 minutes, and then shut it down again until the next scheduled maintenance run.

As the "brain" triggers the Enterprise through its starting sequence (beginning with air starting), any below-minimum engine condition lights a console indicator—and shuts down the engine. At the same time, relays actuate an audible alarm. For example, suppose lube oil pressure is too low. The console light indicating "lube oil pressure" goes on, the audible alarm rings and the engine is automatically shut down, its governor tripped. Thus, the console pin-points the trouble. Besides showing low oil pressure, console lights also indicate (a) low oil fuel; (b) overcrank; (c) too high or low water temperature; (d) low air pressure; (e) too high/low lube temp.; (f) an overspeed shut down.

Cycled, automatic maintenance runs keep the engine's parts oiled, its components "exercised." More important, probably, is the continuous chart which

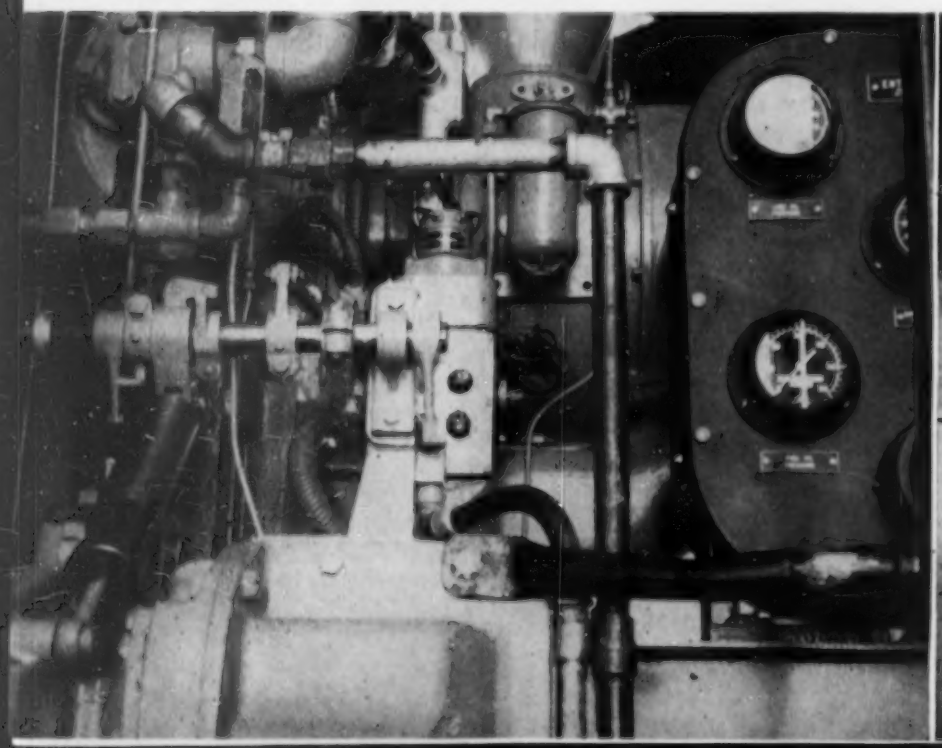


Enterprise Diesel (856 hp.), equipped with Elliott turbocharger, turns Elliott

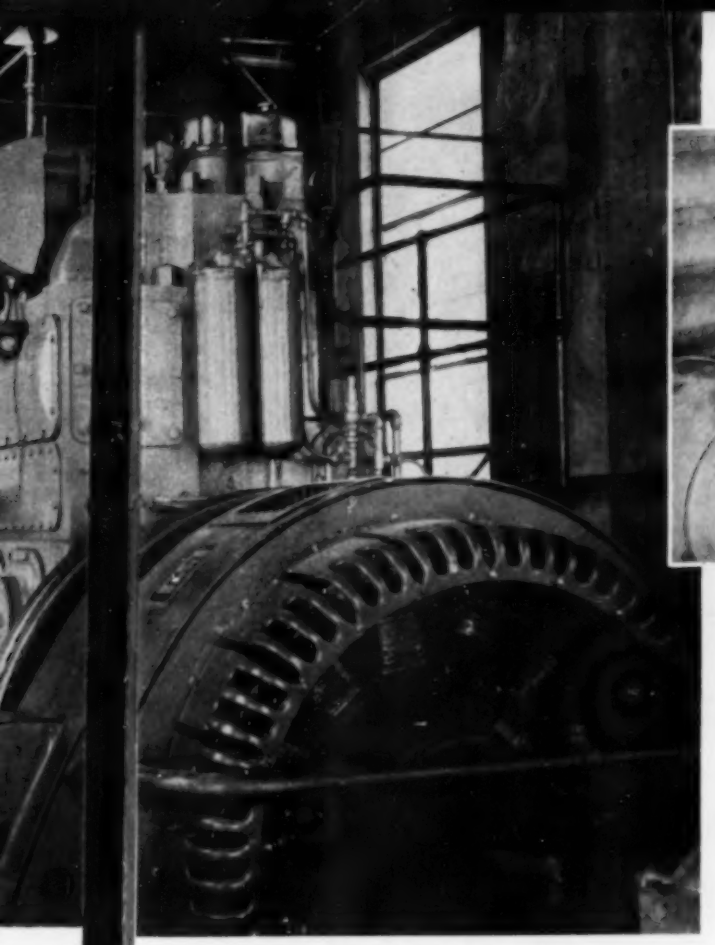
quickly tells maintainers how the engine has responded to start-up. Often, if left to manual operation, a standby engine gets too few maintenance runs. Then, if an emergency arrives, the engine fails to respond. Not so, however, at El Toro. The diesel will be ready for its load whatever and wherever the emergency.

The Custom Built maintenance-run console is another step in eliminating human error in emergency power-plant maintenance. The control has a number of circuits and components, among them an Agastat, a stepping relay and timing motor. All

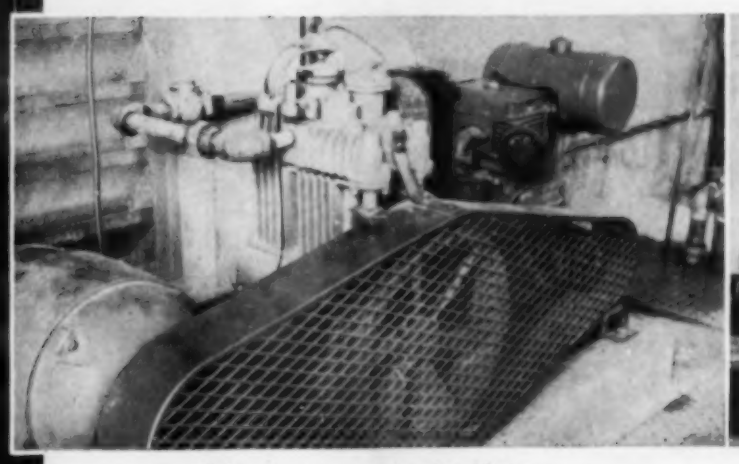
Governor area of the Enterprise diesel, showing solenoid which shuts down Woodward governor if the engine over-speeds.



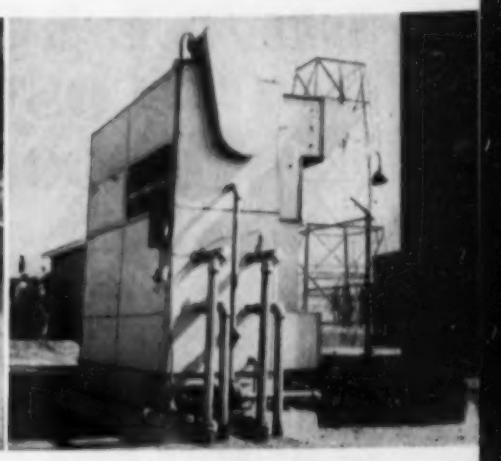
"Brain" of the standby installation is this Custom Built Controls console with Bristol graph.



generator and exciter. Note Winslow filter, and immersion heater in the jacket water line.



Quincy compressor, driven by either a 5 hp. GE motor or a gas engine, assures starting through two 250 psi. compressed air tanks.



Evaporative cooler (Drayer-Hanson) stands beside engine building on side of which can be seen Vortox intake air filter.

are mounted within the console. The Agastat presets the length of crank and rest periods. A small screw on the component's top adjusts crank length; another screw, on its underside, sets rest periods. Settings adjust the crank-rest cycle to fit the peculiarities of any given engine. At El Toro, the Agastat is adjusted for 6-second cranks, 5-second rests. The stepping relay counts cranks and rests, allowing five cranks and four rests. If the engine hasn't started within this time, all further cranking ceases and both the console's overcrank light and audible alarm are energized. The timing motor pre-sets a maintenance run's duration, regulating it between five and 30 minutes. Big advantage: maintainers can pick the day, time of day, length of run best suited for their operation. At El Toro, the engine will automatically test run itself, with the graph recording the operation, for about 10 minutes every third day.

Plug-in relays on the console make maintenance easy. Everything plugs in except the "program clock." It's claimed that the control, reducing or eliminating all but skeleton maintenance crews, can save up to $20,000 annually in salaries alone. Theoretically—and practically, too—maintainers need spend as little as 20 minutes monthly in an actual physical check of the standby installation.

Another of the standby's features is remote control of its Woodward governor—which can either be tripped from the power station's main switchgear or from a control panel on the engine. A solenoid, mounted atop the Woodward UG8-type governor, permits this remote controlling. Other governor control panel components: (a) speed droop indicator; (b) load-limit indicator; (c) sync indicator; (d) synchronizer.

The Enterprise's intake air passes a Vortox Oil Bath filter, then goes to an Elliott turbocharger. Engine exhausts through a Maxim silencer. Meters and indicators on the engine-mounted monitor panel show: (a) lube oil pressure; (b) starting air pressure; (c) lube oil pressure—turbocharger; (d) fuel-oil pressure; (e) jacket-water pressure. There's also a manometer (Meriam Instrument Co.) and an exhaust temperature gauge (Alnor).

Under operational conditions, the engine's lube oil is filtered through a Winslow unit and cooled through a Ross heat exchanger, while fuel oil is cleaned via Cuno and Winslow filters. And all heat exchangers are water cooled, tied into a Drayer-Hanson evaporative cooler. The cooler, mounted outside the power house, is in turn controlled by a Microtherm indicator (Barber-Colman Co.), which opens and closes its shutters, depending upon jacket water temperatures. Normally, jacket water drops 10° during the heat exchange, from its outgoing 180° to an operational 170°. Variance from this actuates the Microtherm switch, which in turn regulates the cooler's shutters.

The plant's 24-hour preparedness is keyed to two immersion heaters (both Wells, rated about 3000 watts), one in the water jacket, the other in a closed lube oil system. These heaters, together with electric driven pumps tied into both systems, maintain engine water and lube oil to operating temperatures. The lube oil system involves an immersion heater in the 350 gallon lube oil tank. It is installed in a concrete sump ahead of the engine. The circulatory pump is a Roper, driven by a small electric motor. This circuit operates only during engine shut-down. When the engine is running, the regular lube system (including a Viking automatic safety control) takes over. The control, incidentally, triggers the audible alarm should the engine's lube pressure drops to 20 psi. from its normal 40 psi. Futher, the unit trips the governor shutting down the engine should lube pressure drop to 14 psi. Meantime, during standby, lube oil circulates in the engine, heated to 140° and ready for immediate start-up.

Fuel oil is stored in a 10,000-gal. storage tank and a 1000-gal. day tank. Mounted above the engine, near the Maxim silencer, is a 100-gal. surge tank, its level monitored by a float-switch, which is in turn connected to a domestic water line. The surge tank supplies make-up to the engine' jackets. An overspeed relay sounds an alarm and trips the governor should engine speed exceed 10% of rated rpm.—that is, in excess of 660 rpm.

Power-wise, a 600 kw. installation isn't usually considered spectacular. Yet at the El Toro Marine Air Station, near Santa Ana, Calif., what otherwise might be termed a "routine" plant takes on real significance. The 10,000 men and women Marines and 1000 civilian employees at the base are responsible for getting a big fleet of Marine fighters airborne. And El Toro, which the Marine Corps calls its "largest and most strategic aviation installation on the West Coast," would be shut down during darkness unless the base's landing lights, control tower and fuel pumps were working. The new diesel standby has but one function: to supply power for these three essential elements of an air base's fighting prowess.

Cdr. H. F. MacKay, USN (CEC), was resident officer in charge of construction. Project engineer was Jack Davis.

List of Equipment

Engine—Model DSG-316 Enterprise; 856 hp. @ 600 rpm., 6-cylinder, 12x15.
Turbocharger—Elliott.
Generator—Elliott.
Exciter—Elliott.
Governor—Woodward.
Maintenance-run controls—Custom Built Controls.
Lube oil filter—Winslow.
Intake air filter—Vortox.
Lube oil cooler—Ross.
Evaporative cooler—Drayer-Hanson.
Thermostat evaporative cooler—Barber-Colman.
Compressor—Quincy.
Compressor power units—General Electric and Wisconsin.
Fuel oil filter—Cuno and Winslow.
Pumps—Pacific Pump, Roper, Bell & Gossett.
Main switchgear—Columbia Electric Mfg. Co.
Switchgear meters—General Electric.
Exhaust silencer—Maxim.
Maintenance graph—Bristol.
Alarm system—Viking.
Jacket water thermostatic valves—Amot.

DIESEL TUGS CUT COSTS $300,000

Four New Vessels Replace Six Steam Tugs in Reading Railroad's Delaware River Fleet; Do More Work With Less Labor and Fuel

THE Reading Co. is currently saving an estimated $300,000 per year in reduced operating expenses since replacing six steam-powered tugboats in its Delaware River fleet with four modern dieselized tugs of new design and greater horsepower. The addition of the new vessels is part of an extensive fleet modernization program undertaken by the company to improve service for its shippers and to provide for future expansion of its through-freight traffic.

The 92-foot tugs, each powered with a 960 hp. Fairbanks-Morse opposed-piston marine diesel engine, can tow a 75% greater load at twice the speed of the older tugs and are expected to save the company approximately $160,000 a year in labor costs alone. Fuel savings should average another $30,000 a year, according to Naval Architect Thomas D. Bowes, Philadelphia, designer of the new vessels. Towing a total of 28 freight cars between the railroad's terminals at Philadelphia and Camden, a distance of 4½ miles, the new tugs are averaging a trip in 60 minutes. This compares to a minimum of from two to three hours formerly required by the steam-powered tugs, despite the fact that these tugs could carry a total of only 16 freight cars per trip, 75% lighter than the new vessels handle.

The four new dieselized tugs are the *Lehigh, Schuylkill, Delaware,* and *Brandywine*. The six steam tugs they replaced had been in service for from 40 to 57 years at the time of their retirement and averaged about 300 ihp. or 255 bhp. Built by RTC Shipbuilding Corp., Camden, the four diesel tugs conform to the highest standards of the American Bureau of Shipping and have been certificated by the U. S. Coast Guard. Their length is 92 ft. 9 in. overall, molded breadth, 25 ft., and molded depth, 11 ft. 6 in. Of all-welded steel construction, they are longitudinally framed to withstand the very large compression thrusts exerted by carfloats towed on each side and their hull forms and fishtail rudders are specially designed for maneuverability. Each is a single-screw vessel, its 7 ft. 10 in. diameter, 4-bladed bronze propeller being driven through a 3.542:1 reduction gear and Air-Flex clutch by a 6-cylinder Fairbanks-Morse marine diesel, rated 960 hp. at 720 rpm.

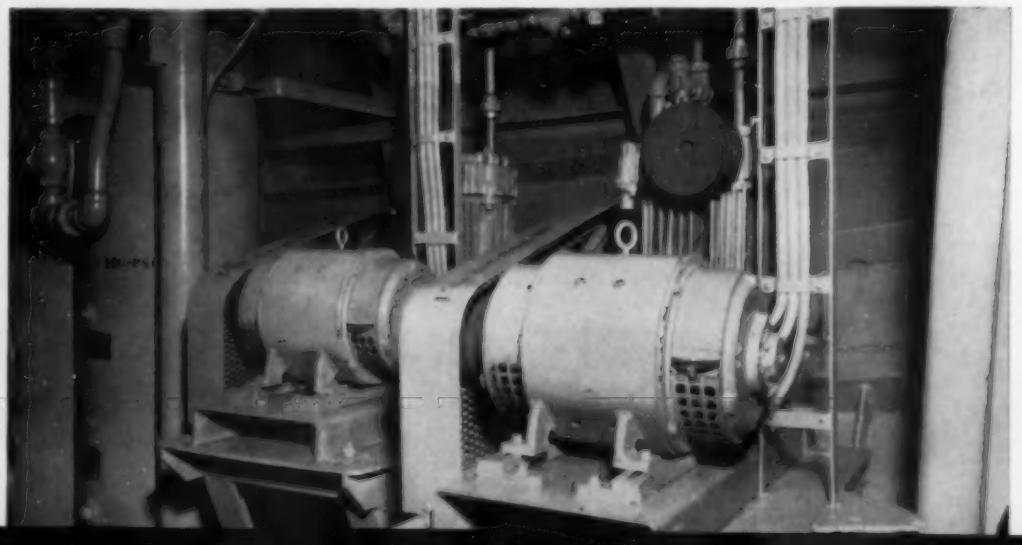
The Reading Co. normally moves a total of 300 to 400 freight cars per day over three routes across the Delaware River. In the past, five steam tugs operated between the Reading terminal at Port Richmond, Philadelphia, and the float ships of the Pennsylvania-Reading Seashore Lines. A sixth steam tug, plus a 25-year-old diesel tug, operated between the company's Pigeon Point wharf at Wilmington and Carney's Point, N. J. This steam tug and diesel tug also operated between Pigeon Point and Thompson's Point, N. J., a distance of 14½ miles. Each of the old steam tugs could move only one 8-car float against the tide and two with the tide, making a maximum of 16 freight cars towed per trip by each vessel. Even by working around the clock, the company fleet was barely able to keep up with the load of 300-400 freight cars per day. The result was a pileup at each terminal when the traffic exceeded the normal rate.

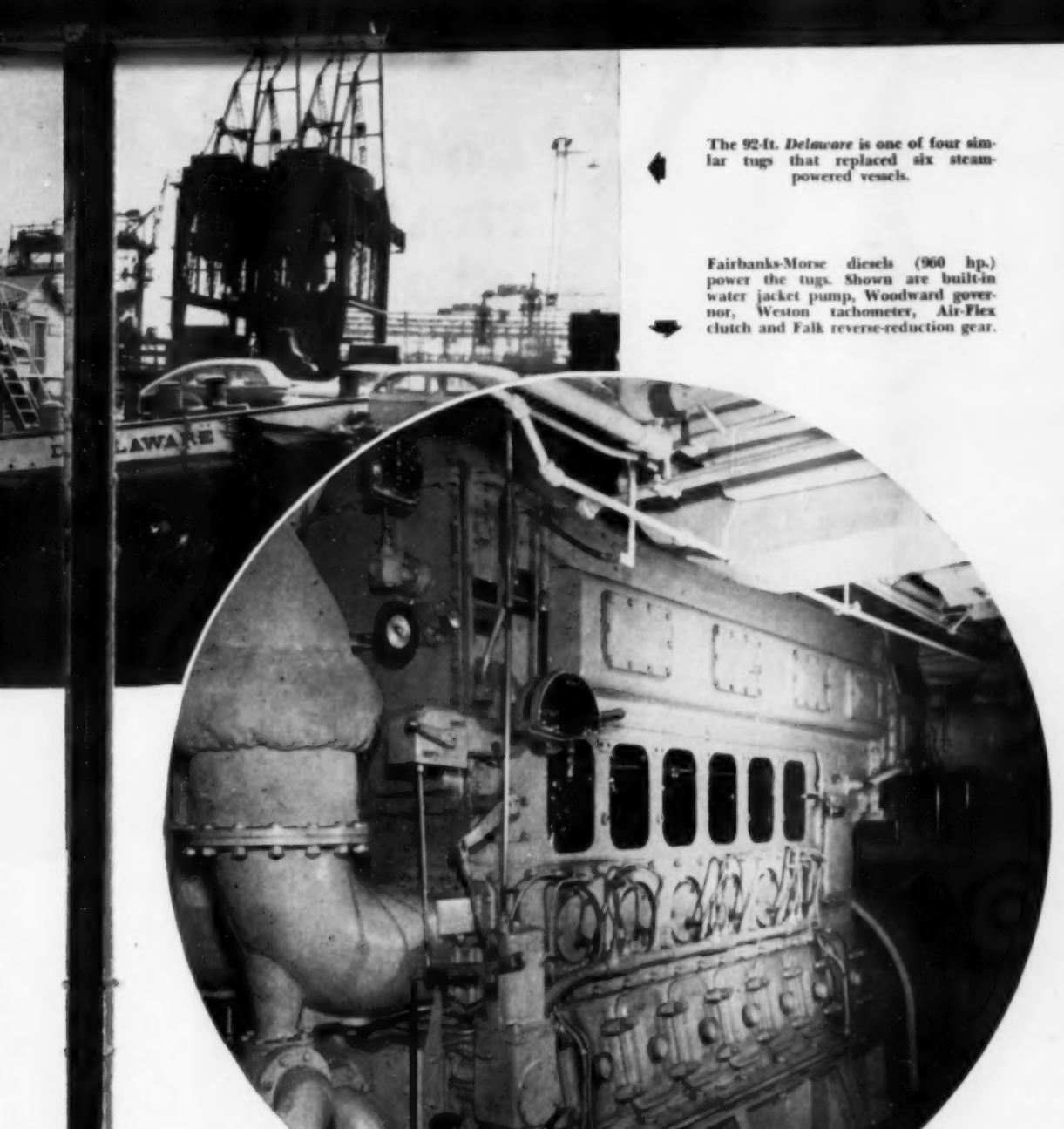
To solve its traffic problems and at the same time to cut the rising cost per freight car shifted, the railroad engaged the Philadelphia naval architectural firm of Thomas D. Bowes, M.E., to prepare an economic survey of the operation. As a result of this survey, it was discovered that the six steam tugs, with their 7-man crews, including one fireman, required an average of 262.8 man-hours of labor per day to move 300 freight cars, including 54.1 man-hours of overtime at time and a half.

By replacing the six steam tugs with four modern diesel tugs of greater horsepower, each tug with a crew of only six men, and by using 14-car carfloats instead of 8-car carfloats, the survey indicated that the same amount of work could be done with only 60 man-hours of labor, including only four man-hours of overtime. This would represent a labor saving of more than 78%. The survey also found that in the same amount of time required to move 300 freight cars with the slower steam tugs, the diesel tugs could move from 600 to 900 cars, providing the company with sufficient reserve towing capacity to handle two to three times as much traffic as future business develops.

To further speed towing operations, the company was advised to sink several dolphins at the bridges at Deep Water Point, just below Wilmington. These dolphins would expedite the docking of car floats and would permit the company to retire its aging 25-year-old diesel tug. The retirement of this diesel tug will cut labor expenditure by another 20%, resulting in a total labor cost savings of ap-

Starting air for the diesels in the tugs is supplied by Quincy compressors, rated 14.2 cfm. at 250 psi., v-belted to pair of motors.





The 92-ft. *Delaware* is one of four similar tugs that replaced six steam-powered vessels.

Fairbanks-Morse diesels (960 hp.) power the tugs. Shown are built-in water jacket pump, Woodward governor, Weston tachometer, Air-Flex clutch and Falk reverse-reduction gear.

proximately $160,000 a year. As an alternative, Mr. Bowes warned in his survey that more than $900,000 would have to be expended within a very short time to put the old steam tugs in satisfactory operating condition. This would be necessary in order to maintain their Coast Guard certificate. Even after these repairs were made, only a slight reduction in operating costs could be realized.

The estimate of $30,000 per year saved in fuel costs is based upon the quicker handling capacities of the new tugs and on the low fuel consumption rate of their engines. These engines are currently operating at the rate of only 15 gph. of fuel. Lube oil consumption is correspondingly low, averaging 0.3 gph. Each of the new tugs has a fuel oil capacity of 22,000 gal., sufficient for 1,466 hours, or more than two months, continuous operation. Stored in three forward bunkers of equal capacity, the fuel is pumped through a full-flow strainer to a 180 gal. overhead day tank by a 10 gpm., motor-driven, rotary-type pump. From the day tank, the fuel flows by gravity to the engine, passing through a set of duplex filters before being picked up by the engine-driven supply pump and sent to the two injection pumps and nozzles at each cylinder.

A high-detergent type lube oil is stored in a 300-gal. storage tank on each vessel. It is pumped under pressure through a full-flow strainer to the bearings, pins and other working surfaces, and to the pistons for cooling, by a built-in, engine-driven pump. A separate motor-driven pump continually circulates lube from the engine sump through a cellulose cartridge-type filter, and back to the sump. Cooling of the lube oil is accomplished in a single-passage, shell-and-tube type cooler, equipped with an automatic, thermostatically-controlled by-pass valve. This valve by-passes fresh water around the cooler as needed to keep the lube at the correct temperature for maximum efficiency.

Jacket water is cooled in a similar heat exchanger, also equipped with an automatic by-pass valve. The water is circulated in a closed system through the engine jackets and around the injection nozzles by means of a built-in pump driven off the lower crankshaft. Scavenging air for the two-cycle Fairbanks-Morse engine is drawn from topside through an oil-bath filter and is sent under pressure to the cylinders by a positive-displacement type blower, driven off the upper crankshaft. Starting air is supplied at a pressure of 250 lbs by two motor-driven compressors. Exhaust gases from the main engine are expelled through a vertical silencer, located in the vessel's oblong stack, just aft of the pilothouse. Ship's service power for each of the four new vessels is supplied by a 40 kw. GMC diesel-generator set, and by a 15 kw., 11g/140-v., 130/107-amp. dc. generator driven off the main engine.

Another feature of these modern tugs is the 300 gpm. fire pump and fire-fighting equipment. This equipment can direct a 100 psi. jet of water from any direction through a bronze fire monitor installed atop the pilothouse or from four hose manifolds on each side of the vessel. In this way each tug can effectively fight fires at the company's freight terminals, as well as protect herself and her tow. The *Lehigh* has already proven the value of having such equipment on board. When a fire broke out recently on a Pennsylvania Railroad bridge above Port Richmond, she was dispatched to the scene and joined other fire fighters in the harbor in helping to bring the blaze under control.

The *Lehigh, Schuylkill, Delaware* and *Brandywine* make a total of seven tugs designed for the Reading Co. by the firm of Thomas D. Bowes, M.E. The same firm designed the 1600 hp. *Shamokin* and her two sister ships, the *Tamaqua* and the *Pottsville*, also powered with Fairbanks-Morse opposed-piston diesels, which joined the Reading fleet in New York harbor in 1952. The *Shamokin* is famous for her performance in the 1952 and 1953 New York tugboat races. For two consecutive years she ran the two-nautical-mile course faster than any other tugboat entered in the event.

List of Equipment

Main Engine—Fairbanks-Morse Model 38D8⅛ 6-cylinder, opposed-piston diesel. 960 hp. @ 720 rpm.

Governor—Woodward.

Auxiliary generator—General Motors Model 4064B, 4-cylinder 4-71 diesel and 40 kw., 125 v. dc. Delco generator.

Engine-driven generator—Safety Car.

Ship's service batteries—Exide.

Lube oil standby pump—Roper.

Air compressors—(2) Quincy.

Unit heaters—(2) Trane.

Lube oil cooler—Ross.

Heat exchanger—Ross.

Temp. regulating valves—Amot.

Lube oil filter—Briggs.

Fuel oil filter—Nugent.

Lube oil strainer—Air-Maze.

Main engine and generator set exhaust silencers—Maxim.

Air intake filter—American Air Filter.

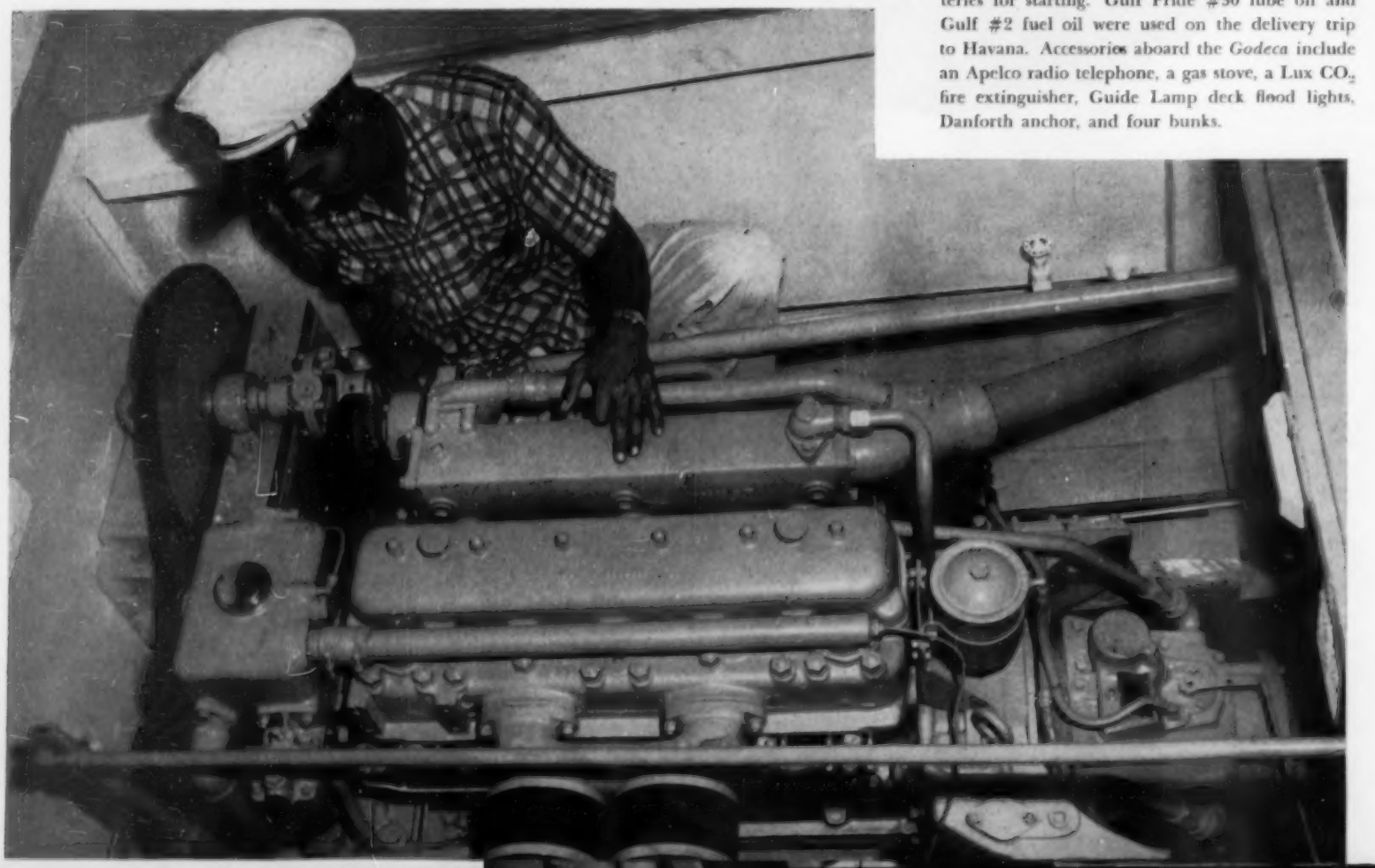
Exhaust pyrometer—Alnor.

Tachometer—Weston.

Tank capacity gauges—Pneumercator.

The 38-ft. *Godeca* on a trial run. The trawler is powered by a 115 hp. Hercules marine diesel and was "packaged" by the Auto Marine Engineers, Miami, Florida.

Capt. Angel Cruz, Havana, Cuba is shown with the engine of his new trawler. The Hercules diesel is equipped with a Paragon clutch and a Twin Disc front power take-off.



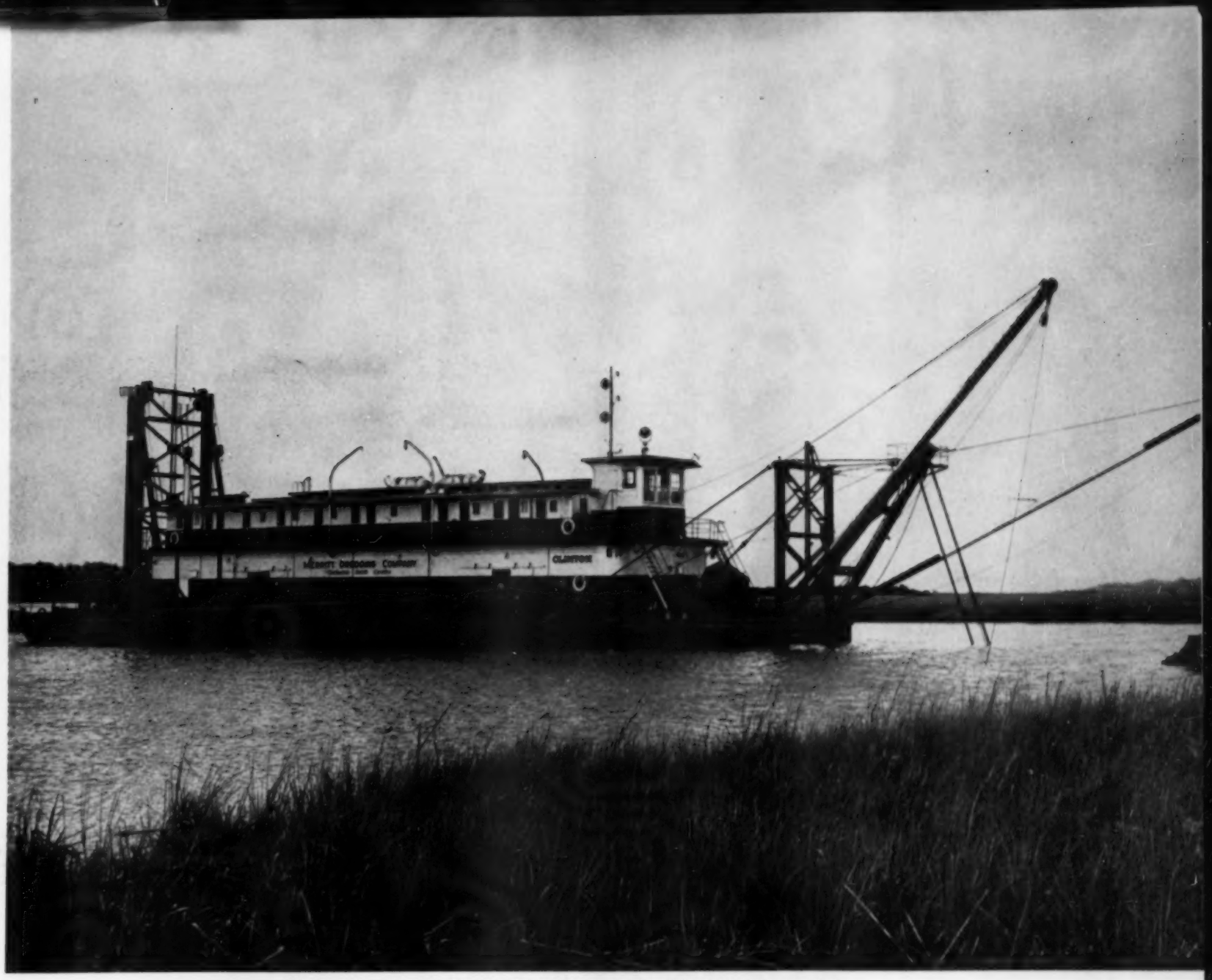
"GODECA" TRAWLS CUBAN WATERS

By ED DENNIS

FROM the bottom of her keel to the top of her mast, the *Godeca* is a nautical portrait of trimness and utility. Her low sleek lines give her the appearance of a pleasure craft instead of a sturdily built fishing trawler. This new-type, inshore craft was built under the supervision of Plato Cox, president, Auto Marine Engineers, Miami, Fla., in the shipyard of R. B. Gilliken, Machelberg, N. C. She was finished at Riverside Boat Works, Miami. The owner is Sn. Luis del Campo, Havana, Cuba.

The *Godeca* has a length of 38 ft., beam of 11 ft. The keel and ribs were made of select Carolina yellow pine covered with one-inch white cedar planking. The open wheelhouse and upper structure was made of marine plywood. The boat is powered with a Model DIXEC 6-cylinder Hercules marine diesel. It develops 115 hp. at 3000 rpm. through a Paragon 2.3:1 reverse and reduction gear and turns a 22x18 Columbian propeller. A Walter clean-flo keel cooler is being used.

The engine is fed from two steel fuel oil tanks of 400 gals. The Hercules supplies power for the trawl hoist through a Twin Disc front power take-off. Also in the engine compartment is a Marine Products fire and bilge pump and Southway batteries for starting. Gulf Pride #30 lube oil and Gulf #2 fuel oil were used on the delivery trip to Havana. Accessories aboard the *Godeca* include an Apelco radio telephone, a gas stove, a Lux CO_2 fire extinguisher, Guide Lamp deck flood lights, Danforth anchor, and four bunks.



A 1500 hp. General Motors Diesel replaced the steam engine which originally powered the hydraulic dredge pump on the 140x36-ft. *Clinton*, used for a variety of jobs up and down the Atlantic Coast.

DREDGE "CLINTON" CONVERTED TO DIESEL FROM STEAM POWER

Two Years of Work in Merritt Dredging Co. Yard Modernizes Vessel Purchased from Army Engineers

THE hydraulic pipe line dredge *DeWitt Clinton* was built for the Corps of Engineers, U S. Army, in 1932 by the Ellicott Machine Corp., Baltimore, Md. It has a heavy steel plate hull, 36 ft. wide, 140 ft. long and 9 ft. deep. There is a steel deckhouse with crew's living quarters above. As originally built, the main pumping unit consisted of a 700 hp. triple expansion steam engine, direct connected to a 20 in. centrifugal dredge pump having a 20 in. discharge line. Later, the discharge line was reduced to 18 in. The *DeWitt Clinton* was 100% a steam-powered dredge, including main engine, cutter engine, winder gear engine, boiler feed pumps, light plants and other steam equipment.

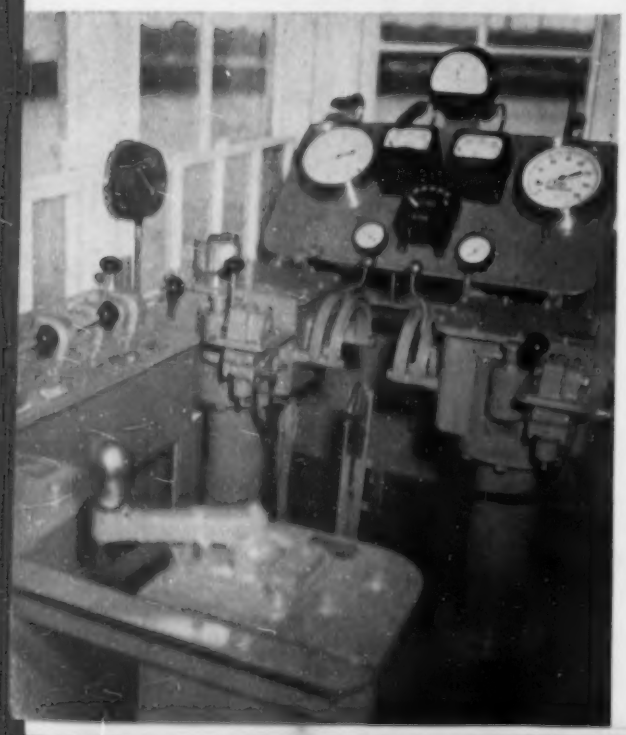
In 1951 the *DeWitt Clinton* was purchased by the Merritt Dredging Co. of Charleston, S. C., from the United States Corp of Engineers. Soon after purchase, the dredge was towed to the Merritt Dredging Co.'s repair yard at Charleston, S. C. The name was changed to *Clinton*.

After arrival at the yard, work was started on removal of all steam machinery. All work was done by the Merritt forces. After removal of all the steam equipment, most of which was sold for junk, work was started on installation of diesel engines and new electrical equipment. In other words, a complete conversion from steam to diesel and electricity was undertaken. Two years were required to complete the conversion.

The old 700 hp. steam engine, which was direct connected to the hydraulic dredge pump, was replaced with a General Motors 16-278A diesel engine of 1500 hp., driving a 16 in. hydraulic dredge

This 900 hp. General Motors Diesel drives Electric Machinery generators. Electricity generated runs the cutter motor and other lifting apparatus on the 60-ft. steel ladder.

Westinghouse Air Brake controls in the "lever room" make it easy and efficient to operate a five-drum hoist and other gear on the *Clinton*.



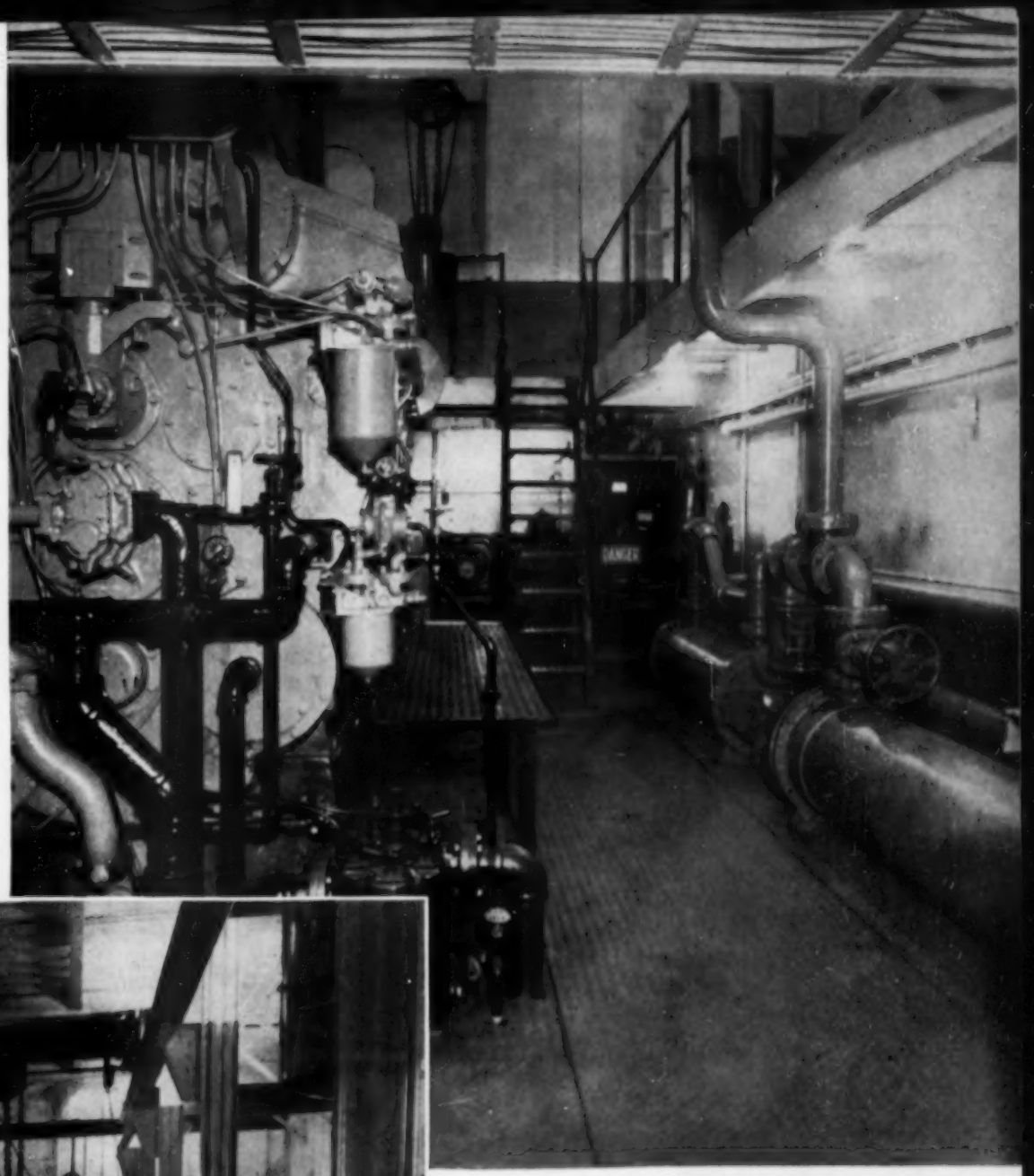
pump through a Westinghouse 2:1 reduction gear. The horsepower on the main pump was doubled and the size of the pump reduced from 20 to 16 in. In addition to the main diesel engine, a 900 hp. General Motors 12-567 diesel engine, direct driving a 30 kw. ac. generator and a 250 kw. dc. generator, was installed in the after cockpit, formerly the boiler room. The dc. generator drives a 300 hp. cutter motor installed on the 60-ft. steel ladder. The 300 kw. ac. generator provides current for a motor generator set, which in turn drives a 75 hp. Ward Leonard controlled, dc. motor on the five-drum hoist, and a motor generator set, driving two 50 hp. dc. motors on two new independent spud hoists installed at the stern of the dredge on a foundation built level with the upper deck. The balance of the ac. power is used throughout the dredge for lighting and on all auxiliary pumps, such as raw and fresh water, heat exchanger, engine circulating, bilge, water transfer, and fuel transfer pumps. Shop equipment is also driven by ac.

Also in the stern cockpit is located a General Motors 3-278A diesel engine generating unit with 100 kw. ac. generator and 20 kw. dc. generator. This unit is known as a "stand-by" plant and is

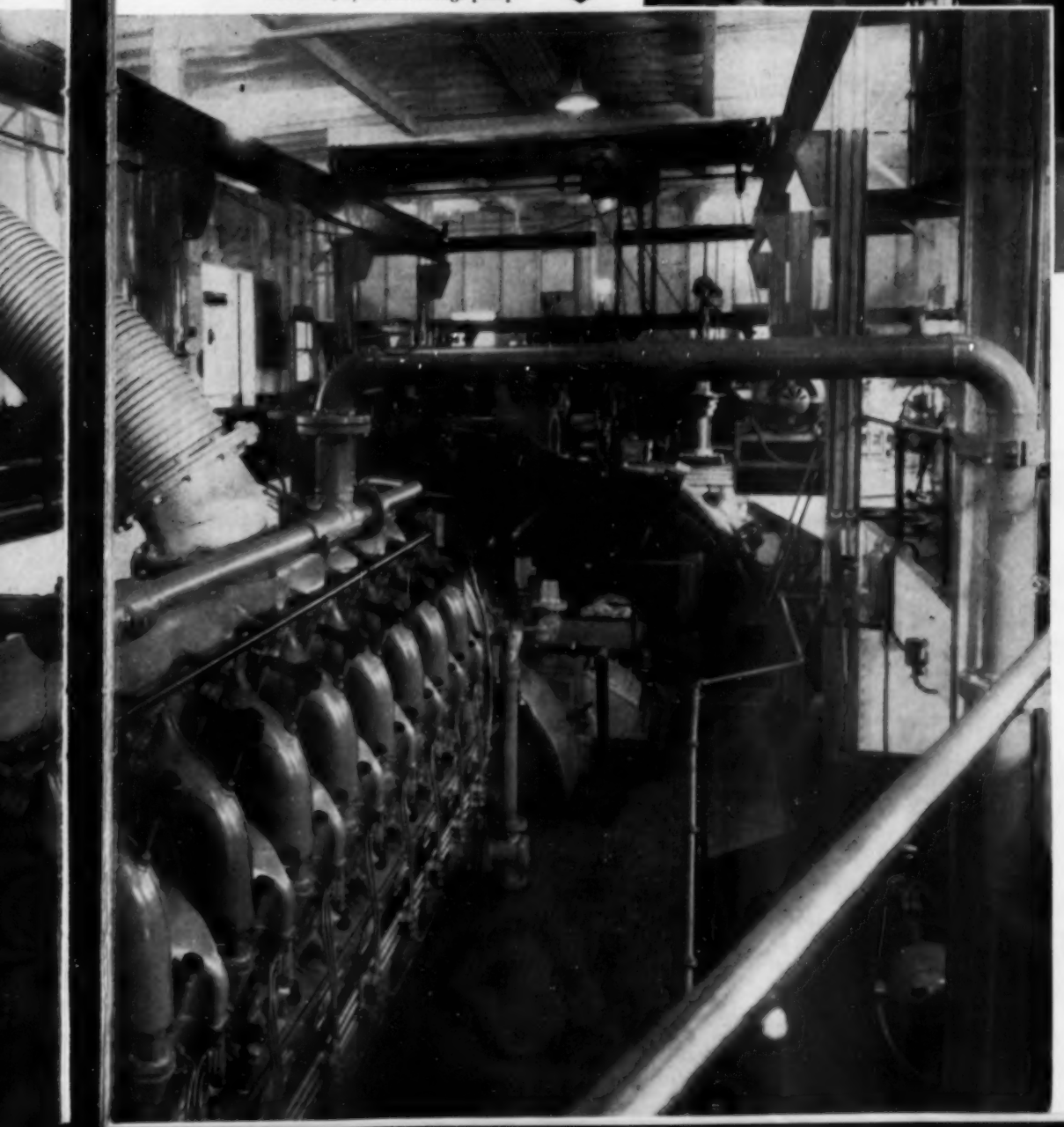
used when the 900 hp. generator unit is not required, such as on Sundays when the dredge is not in operation, or when the dredge is being towed from one location to another.

The pilothouse (lever room) controls were changed from the old style, back-breaking, hand levers to new Westinghouse air controls for easier and more efficient operation. The five-drum hoist located on the forward engine room deck is completely air operated, as are the independent spud hoists on the upper deck at the stern. The spud hoists, located at the stern, use much shorter cables than formerly, when operated from spud drums located on the forward deck. The two drums formerly used for spud hoist cables are now used for the anchor booms, newly installed on the *Clinton* bow. Anchor booms, not used under government ownership, have proved very successful.

All machinery and electrical equipment are of the latest design, located for safety, efficiency and easy operation. Engineering work, blueprints, etc. were furnished by the Paulson Engineering Services of Charleston, S. C. Actual installation of all pumps, engine foundations, diesel engines motors, generators, motor generator sets, electrical equipment,



Looking forward, this shows the 1500 hp. GM diesel, the hydraulic coupling, Westinghouse 2:1 reduction gear, and the 16-in., hydraulic dredge pump.



Port side of 900 hp. GM diesel, located in aft cockpit. Marquette governor shows in foreground. This engine drives in tandem, one 312 kva. ac. and one 250 kw. dc. Electric Machinery generators.

heating units, piping, wiring and other miscellaneous equipment was done by Merritt forces.

The crew's quarters on the upper deck have a capacity for 45 men. The dredge is generally operated by a crew of 35 men working in three eight-hour shifts. A complete galley is part of the crew's quarters. The rooms for the crew and the lever room are fitted with individual thermostatically-controlled electric heaters.

The *Clinton* can dredge to 40-foot depths and can pump efficiently through pipe lines up to 7500 feet. The field of dredging operations is usually in ports on the Atlantic Coast from Norfolk, Va., to Miami, Fla. The Intracoastal Waterway is used in transporting dredge equipment from one port to another. Dredge work consists of channel and harbor dredging, industrial, and real estate fills, highway fills, causeways, bridge approaches, dams and levees. The *Clinton* is owned and operated by the Merritt Dredging Co., a partnership consisting of Harry Merritt, Richard S. Merritt and Duane S. Merritt, all of Charleston, S. C.

Improves Chicago Facilities

Effective with January 17th, DIESEL PROGRESS' new Chicago address will be Suite 940, 50 North La Salle Street, Chicago 2, Illinois. Phone: DEarborn 2-3533.

The Chicago office of DIESEL PROGRESS has been, and remains, under the direct supervision of Mr. Bruce Wadman, the Mid-West Editor. The expanded facilities have been necessitated by the improved and increased services being provided the Mid-West territory. The response since the original establishment of the Chicago office has been such that the demands on it have been constantly increased. The new office will meet those increased demands on it.

Elected President of Fram

T. H. Belling

Mr. Theodore H. Belling was elected president of the Fram Corporation, Providence 16, R. I., at the annual meeting of the board of directors. Mr. Belling succeeds Mr. Steven B. Wilson, who retires as president but remains as chairman of the board of directors of Fram, one of the world's largest filter manufacturers. In making the announcement, Mr. Wilson said: "Mr. Belling's long experience in the automotive after market industry and his faithful and loyal service to this corporation during the 15 years he has been with us fully qualify him to assume the responsibilities of his new position."

Joining Fram in 1939 as general sales manager, Mr. Belling was promoted to vice president in charge of sales in 1940. In 1942 he was named vice president and general manager, and he became executive vice president in 1944, serving in this position until his appointment as president. Another vacancy was filled by the Fram board of directors when Miss Doris A. Glover was elected secretary to replace the late T. Edward Aldham who died recently.

Two new members of the Fram board of directors were also elected at the meeting. The two new directors are Arthur F. Pettet of Lincoln, vice president and general manager of Fram; and Howard E. Robinson of Barrington, vice president in charge of sales. Ralph W. Haslehurst, presently assistant treasurer of the company, was also named by the board of directors as assistant secretary.

The board of directors meeting was held in the new Fram World Headquarters Building on Pawtucket Avenue in East Providence. The Company in 1954 celebrated its 20th anniversary.

Outboard Propulsion Unit Catalog

A completely new 12-page catalog of the Murray & Tregurtha Harbormaster outboard propulsion and steering units has recently been issued. This new catalog illustrates and covers in detail the Harbormasters which are complete marine power and steering units, in one package and easily installed for immediate use.

Moxiels range in size from 40 to 400 hp, gas or diesel. Included in the catalog are features of design and construction, specifications and many photos of Harbormasters in action showing their great maneuverability and versatility. Their heavy-duty performance makes them applicable in such craft as barges, towboats, ferries, dredges, lighters, etc. The catalog is available on request to Murray & Tregurtha, Inc., 80 Hancock St., Quincy 71, Massachusetts.

Resumes Building Clippers

After more than three years the first tuna clipper to be built in Tacoma since the three big local yards converted to Navy work and got out of the Clipper business, announcement has been made by the J. M. Martinac Shipbuilding Corp. that it will start work on a 130 ft by 30 ft by 14¼ ft wood and diesel tuna clipper to feature a completely laminated frame along lines successfully developed by that company in building the 171 ft AM class Navy minesweepers. Actually the very last Clipper completed before the long drought was the *Southern Pacific*, at the Martinac yard.

Designed by J. M. Martinac personally, the new vessel will have keel, keelson, stem, horn timber and beams laminated from Douglas Fir strips while the 80 frames will be laminated white oak, all using the Northwest Syndicate's electronic glue setting equipment that permits very fast handling. Power will be a 900 hp Enterprise diesel, swinging a 5 bladed 94 inch Coolidge propeller through a 2-1 reduction gear. The large auxiliary load will be handled by two 100 kw Enterprise and a 60 kw General Motors diesel generating sets. Capacity will be 325 tons of frozen tuna and delivery will be sometime next summer.

Director of Information

The appointment of Dana T. Hughes as director of information of American Locomotive Company has been announced by E. W. Manterfield, director of public relations. Having joined Alco in February, 1952 as a member of the public relations department, Mr. Hughes has been acting head of the company's news bureau since November, 1953. He was previously employed as assistant to the public and personnel relations manager of Dixie Cup Company at Easton, Pa. He was born at Glen Ridge, N. J. and attended high school there. He is a veteran of four years service in the U.S. Marine Corps and a graduate of Lafayette College, class of 1949.

Orders 163 Diesel Locomotives

Being built by the Electro-Motive Division of GM, the American Locomotive Co. and General Electric Co. are 163 new diesel units for the Southern Pacific Co. According to President D. J. Russell of Southern Pacific, they will go into service during the first five months of this year and will increase the road's diesel horsepower to over 2.3 million.

Diesels are, more and more, taking over the handling of the railroad's freight, passenger and yard switching service.

Over 85% of the line's gross ton-miles of freight, 78% of passenger train miles and 81% of yard switching service is so handled. Over $30 million in expenditures for diesel motive power has been authorized by Southern Pacific in the past 6 to 8 months, raising the company's investment in diesels to about $245 million, a total of 1,520 units

WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.

DIESEL OPERATING COSTS

IN the Report on Heavy-Oil engine Working Costs and Performance (1953), published by The Diesel Engine Users Association, London, details are given in respect of 91 plants comprising 428 engines operating in generating stations and waterworks both in Great Britian and overseas. In the corresponding 1953 Report on Oil and Gas Engine Power Costs, submitted by the Subcommittee on Oil and Gas Engine Power Cost, Oil and Gas Power Division of the American Society of Mechanical Engineers, there are listed 187 plants comprising 557 engines. Of these, 44 plants contain dual-fuel or gas engines to a total of 115, whereas in the D. E. U. A. Report only oil engines are included. The basic principles used for compiling the two reports are largely similar, though the methods of presentation are somewhat different.

A specially useful feature of the D. E. U. A. Report is the Summary of Results in which maximum, minimum, and average figures are shown in respect of the various items listed. The prospective user can obtain a good general guide from the averages.

Considering the costs shown in the Summary, it will be found that for the home stations approximately half the total operating cost is attributable to the fuel bill, while a further third is absorbed by the running wages or attendance and supervision. It should be borne in mind that the cost of fuel in bulk is more than double in England as compared with the United States.

It will be seen that there is no great variation as regards specific fuel consumption or lubricating oil consumption despite the wide differences in loading conditions. Waterworks stations normally operate continuously day and night which accounts for the high running plant load factor (or running plant capacity factor) of 76.2 per cent. Many of the home generating stations operate on peak load or stand-by duties and are seldom called upon for their full capacity.

Contributors to the report are asked to send details of any interesting engine failures or repairs in respect of their plant, and a number of useful comments are published.

CYLINDER LINER RECLAMATION. Ref. No. 55. "Experience with cylinder liners which have been reconditioned by a porous chrome deposit method has proved satisfactory."

CYLINDER LINER CORROSION. Ref. No. 1. "The liners in some engines have been scrapped owing to excessive corrosion on the water side which almost penetrated the whole thickness of the metal before scrapping limits for wear were attained. Electrolysis and quality of cooling water as causes of the trouble have been eliminated."

PISTON RING GROOVE WEAR. Ref. No. 32. "The top ring groove of pistons wore very badly and to cure this the grooves were machined out and double rings fitted."

CRANKCASE EXPLOSIONS. Ref. No. 37. "During the year there have been several crankcase explosions. In every case these have been caused by cracked piston crowns, brought about by the crowns receiving insufficient cooling oil."

DETERGENT LUBRICANTS. Ref. No. 13. "On

SUMMARY OF RESULTS

34 Home Generating Stations

Item	*Maximum*	*Minimum*	*Average*
Fuel Oil per KWHR, lb.	1.100	0.522	0.622
Lub. Oil, Rated BHP Hrs. per gal.	9,720	526	2,850
Costs per KWHR, pence			
Fuel	1.726	0.665	1.002
Lub. Oil	0.221	0.012	0.064
Stores and Water	0.187	0.002	0.036
Running Wages	0.850	0.019	0.663
Repairs and Maintenance	2.399	0.008	0.321
Total	9.631	0.897	2.086
Running Plant Load Factor, per cent.	27.2	1.0	12.0

36 Overseas Generating Stations

Item	*Maximum*	*Minimum*	*Average*
Fuel Oil per KWHR, lb	0.789	0.392	0.610
Lub. Oil, Rated BHP Hrs. per gal.	7,360	622	2,445
Costs per KWHR, pence			
Fuel	1.857	0.143	1.050
Lub. Oil	0.295	0.031	0.098
Stores and Water	0.070	0.002	0.016
Running Wages	1.596	0.043	0.276
Repairs and Maintenance	0.791	0.037	0.253
Total	3.175	0.499	1.693
Running Plant Load Factor, per cent.	52.6	4.8	27.4

17 Home Waterworks Stations

Item	*Maximum*	*Minimum*	*Average*
Fuel per Water-Horsepower Hr., lb.	1.227	0.391	0.688
Lub. Oil, Rated BHP Hrs. per gal.	6,380	434	3,080
Costs per WHP Hr., pence			
Fuel	2.040	0.648	1.102
Lub. Oil	0.126	0.018	0.050
Stores and Water	0.178	0.001	0.023
Running Wages	3.600	0.114	0.620
Repairs and Maintenance	0.956	0.043	0.288
Total	6.748	1.004	2.083
Running Plant Load Factor, per cent.	102.3	46.3	76.2

one engine a heavy duty oil was used for the cylinder lubricators but a straight mineral oil was retained in the crankcase. The change has resulted in cleaner pistons but shows only a slight reduction in the incidence of ring sticking." Ref. No. 42. "Since changing over to a heavy duty lubricating oil, stuck piston rings have been almost negligible."

MARINE DIESEL FUEL. Ref. No. 11. "As from November 1952 marine diesel oil was used instead of gas oil, and the following points have been observed:—more rapid build-up of carbon on exhaust valve stems, especially on one engine which has well worn valve guides; a slight increase in valve-face pitting; and a tendency to form carbon trumpets on the fuel injectors." Ref. No. 46. "In December 1953 the engines were changed from gas oil to marine diesel oil. No data are yet available which might show an increase in the rate of wear. There has been no increases in maintenance." Ref. No. 67. "On changing over from gas oil to marine diesel oil, the fuel consumed per unit generated increased slightly, otherwise engine running and maintenance were about the same. The fuel pipes on some engines have split."

CYLINDER HEAD REPAIRS. Ref. No. 71. "Certain cracks in cylinder heads, which had previously been repaired by the deposition of copper, were found to have recurred."

Dr. Diesel Visits Cummins

On hand to greet Dr. Eugen Diesel of Oberbayern, Germany (center) at the plant of Cummins Engine Company, Inc., Columbus, Indiana, were: (left) R. E. Huthsteiner, president and (right) D. J. Cummins, vice president—Engineering. Dr. Diesel is the son of the inventor of the diesel engine, Dr. Rudolf Diesel. During his visit to Cummins, Dr. Diesel showed particular interest in the technical aspects of the 1952 Cummins turbocharged diesel Indianapolis 500-Mile Race entry. Here, the three men are shown near one of the newest members of the Cummins line, the 150 horsepower Model JBS-600 diesel. Dr. Diesel is a doctor of philosophy and an author. He has written a biography, "Rudolf Diesel, the Man, his Work, his Fate."

Northwest Distributor Named

Appointment of the Pacific Fishing & Trading Co. as Pacific Northwest distributor for Nordberg's gasoline marine engines and "Power Chief" diesel engines is announced by Nordberg Manufacturing Co., Milwaukee 1. Serving pleasure boat owners as well as fishermen and work boat operators, Pacific Fishing & Trading Co. will offer Nordberg gasoline marine engines in the Territory of Alaska and Washington state except along the shores of the Columbia river. The sale and service of "Power Chief" diesels is undertaken only in Washington.

Two Enterprise Appointments

B. A. Robbins

R. E. Kroek

John Sheusner, manager of operations of the Enterprise Division, General Metals Corporation, has appointed R. E. Kroeck to the position of manager of manufacturing and B. A. Robbins to the position of manager of engineering, both of the Enterprise Division. Mr. Kroeck has a background of thirty years with the company. Prior to his new assignment he was manager of production control and purchasing. He served before that as purchasing agent. Mr. Robbins has been with Enterprise since 1947, having started as a material and process engineer. He held the position of chief products development engineer prior to his new assignment. A graduate of Brown University in electrical engineering, he was connected with General Electric Co. at their Lynn, Massachusetts plant for six years before joining Enterprise. He was an engineer in General Electric's aircraft gas turbine development department.

European Diesel News

By **Hamish Ferguson**

NEW MOBILE DRILLING RIG. A new truck-mounted drilling rig, designed to facilitate mineral exploration and similar duties, has been produced for Failing Supply Co. Ltd. by Mitchell Engineering Ltd. Built on a short-wheelbase Leyland Comet truck, and employing Leyland units for ancillary transmission, it is completely self-contained. A Leyland 5.76 litre, 90 hp diesel provides power for transportation, erection of the mast, and operation of the drill. The machine drives a mud pump, draw-works, drill-head, and hydraulic pump through an auxiliary Leyland gearbox placed halfway along the chassis. When preparing for work, the 40 ft.

mast is raised to its vertical position by two double-acting hydraulic cylinders. At the top of the mast is a four-sheave crown block distributing its load equally to all legs. The mast can handle a load of 15,000 lb. of drill pipes which enables a depth of 2,500 ft. to be reached with 2⅛ in. dia. drill pipe. The drill head is driven by means of spiral bevel gears through the four-speed auxiliary gearbox. An Evans Duplex reciprocating pump delivers 200 gal. per minute of "mud" for cooling the drill bit and removing rock chippings. The pump is operated by a chain drive taken from the auxiliary gearbox input shaft, as is the hydraulic pump. The draw-works, which is a winch used for raising and lowering the drilling string, is driven by worm gears from the auxiliary gearbox. All controls are manually operated.

DOXFORD OUTPUT. During 1954 William Doxford & Sons Ltd. of Sunderland built six new ships of which the largest is a tanker of 11,377 gross tons, the remainder being cargo vessels totalling 35,890 gross tons. All the ships were equipped with the well-known Doxford opposed-piston two-stroke engine, the total power output being 33,860 ihp.

TURNER DIESELS. The Turner Manufacturing Co. Ltd., Villiers Street, Wolverhampton, are offering a range of small water-cooled engines built up into complete, easily transportable units for use as power packs and water pumping sets. The engines are made in single, twin, and four-cylinder sizes, and power outputs range from 4 to 33 bhp over a speed range of 600 to 1,800 rpm. The twin and four-cylinder engines are designed in Vee-form.

AGRICULTURAL TRACTOR PRODUCTION. The production of agricultural tractors in England is steadily increasing, and the following figures in respect of wheeled vehicles have been published covering the 9 months ended September 1954, as compared with the same period in 1953.

	1954		
	Export	*Home*	*Total*
No. of Tractors	74,755	28,500	103,255
	1953		
	57,758	23,587	81,345

The number and value of exports which include track-laying, wheeled, and horticultural types are shown by the following figures:—

	1954		*1953*	
	No.	*£*	*No.*	*£*
1. Australia	13,966	5,191,074	9,932	3,506,570
2. U. S. A.	7,856	3,024,843	3,429	566,456
3. Union of South Africa	6,093	2,643,070	5,066	2,042,173
4. New Zealand	6,279	2,432,805	4,726	1,872,080
5. Denmark	6,287	2,310,446	6,713	2,531,914
6. Sweden	5,579	2,306,391	9,415	3,745,711
7. Italy	3,733	1,823,599	3,302	1,676,745
8. Irish Republic	3,791	1,718,087	2,487	1,029,269
9. Canada	3,795	1,464,267	3,255	1,573,078
10. Norway	3,533	1,408,645	2,471	920,713
11. Others	23,857	11,879,630	20,834	10,878,951
Total	84,769	36,202,857	71,630	30,343,660

A NEW SUPERCHARGED TWO-STROKE ENGINE. The Gotaverken Company of Goteborg, Sweden, have developed for the Swedish Navy a new type of highly-supercharged two-stroke engine working on the opposed-piston principle. Having ten cylinders, 7.09 in. bore by 2 by 9.55 in. stroke, it is rated at 2,500 bhp at 920 rpm. Charging air is supplied by an intercooled exhaust gas turbo-charger at a pressure of 23 psi..

M. A. N. SUPERCHARGED ENGINES. The remarkably low consumption of 0.30 lb. per bhp per hour has been recorded on the German M. A. N. experimental engine, type K6 V30/45. The six-cylinder engine has a bore and stroke of 450 mm. and 660 mm. respectively, and develops 2,800 bhp at 250 rpm, showing a bmep of 227 psi. Supercharging is by means of an exhaust turbo-blower which compresses a 3-stage turbine driving a 14-stage axial compressor. The engine is of the crosshead type and incorporates oil-cooled pistons.

MIDGET SUBMARINE. The Royal Navy has recently carried out trials of a new type midget submarine, H. M. S. X51. The overall length is 54 ft. and a crew of five are accommodated. The craft was built by Vickers-Armstrongs Ltd. of Barrow-in-Furness, and it is powered by Perkins diesel engines and by electric motors.

LISTER LIFEBOAT. The 3½ hp air-cooled diesel built by R. A. Lister Ltd. Dursley, Glos., has now been adapted for marine purposes. Weighing only 250 lbs and coupled to an 11 in. dia reversing propeller, it has been fitted into a wooden lifeboat of 21½ ft length and 7 ft beam. During recent trials before the Dutch Shipbuilding Inspectors, the boat was loaded with 25 adults and three children. Measured speed upstream was 4.9 knots and downstream 5.4 knots, giving a mean speed of 5.15 knots.

Two Organizational Changes

Two major organizational changes were announced by Robert F. Black, president of The White Motor Company. Henry J. Nave, director of service has been elected president of The White Motor Company of Canada, Limited, to succeed L. M. Hart who will continue as a director of the Canadian subsidiary. Karl A. Roesch, assistant to the vice president in charge of sales and a White employee since 1928 was named to succeed Mr. Nave as director of service.

In announcing the personnel changes, Mr. Black said that White Motor's volume of parts sales and service business, the department which Mr. Roesch now heads, has doubled in the last five years, under Mr. Nave's leadership. White's operations in Canada are expected to be expanded, the first phase already having been announced. A huge new truck sales and service center, believed to be the largest of its kind in Canada, is being built by White in Montreal.

GM Diesel Distributor

Appointment of the T. E. Potts Equipment Company of Buffalo, N. Y., as distributors of General Motors Diesel engines has been announced by the Detroit Diesel Engine Division of General Motors. Factory-approved sales and service facilities for these engines have been established at the company's headquarters at 2260 Sheridan Drive in Buffalo.

The new distributor already represents a number of equipment manufacturers who offer General Motors Diesel engines as optional power in their products.

These include Euclid earth moving vehicles, Galion road graders and Thew-Lorain cranes and shovels.

Modernization Program

The modernization program of C & F Logging Co. at Gardiner, Oregon included purchase of a Perkins P-6 high speed diesel engine to repower a BU-30 Skagit Loader, according to E. A. Clauson, owner and manager. A second Perkins P-6 was installed in a Berger Swing Donkey for the greater speed and power required to bring heavy logs to the landing. Both diesel engines were supplied by Perkins Engine Division of Paul E. Keeney Co., Portland, Oregon.

Gulf Coast Diesel Notes

By Michael T. Pate

WESTERN Company, Midland, Texas, has bought through Stewart & Stevenson Services, Inc., Houston, 32 General Motors diesels, series 110. Sixteen of these diesels are being installed under the hoods of as many trucks with a similar unit mounted on the truck bed. The two 220-hp diesels can be compounded to drive high pressure pumps, the units being designed for oil-well sand fracturing service.

BORDER Foundry & Machinery Company, Laredo, Texas, has secured through Fairbanks, Morse & Company a model 49B4½ diesel rated 180 hp at 1800 rpm.

BROWN & Root, Inc., Houston, have bought through Mustang Tractor & Equipment Co., Houston, a model D315 Caterpillar diesel direct-connected to a 40 kw 3 phase 60 cycle generator which will be used on a pipeline dredge.

ABBOTT & Traxler, Corpus Christi, Texas, have bought six General Motors series 71 diesels. These 6-cylinder engines have been adapted for operation with the crankshaft in a vertical position, and will be direct-connected to Stewart & Stevenson Redhead turbine pumps for irrigation service.

GULF Southwestern Truck Line, Houston, has bought through Cummins Sales & Service a model JBS 150 hp Cummins diesel which will be used to repower a heavy duty truck.

MISSION Manufacturing Company, Houston, has secured from Stewart & Stevenson Services, Inc., of Houston, a General Motors electric-diesel unit, model EMP. The 600 hp 6-cylinder diesel will power a Wilson-Snyder 220-P slush pump to develop high pressures for testing.

LIGHTHOUSE, Inc., Houston, has taken delivery of four more BD77, 15 hp Buda diesels, to bring their total of such plants to 36. Delivery was made by Buda Engine & Equipment Company, of Houston.

ARYON G. Boudreau, New Iberia, Louisiana, has installed a new 135 hp Waukesha model DKBS diesel in one of his trucks. The diesel was secured through Waukesha Sales & Service, Houston.

MIKE Hicks Tools & Cementing, Inc., of Houston, has installed under the hood of his large, heavy duty truck a 300 hp model NHRBS Cummins diesel and has mounted a Cummins model JBS, rated at 150 hp, on the truck bed for auxiliary power. Delivery of both diesels was made by Cummins Sales & Service, Inc., of Houston.

TEXAS Gulf Sulphur Company, New Gulf, Texas, has bought through Stewart & Stevenson Services, Inc., a series 110, General Motors diesel equipped with torque converter, to drive a high pressure circulating pump.

GULF Southwestern Transportation Company, Houston, has secured from Waukesha Sales & Service, Inc., Houston, a model 135DKBS Waukesha diesel to repower an International Harvester truck. The engine is rated at 150 hp at 2000 rpm.

T. J. FALGOUT, Galveston, Texas, is repowering his 75-foot steel offshore crew boat, *The Skip* with a General Motors series 110, diesel unit equipped with 4.5:1 hydraulic reduction and reversing gear.

ROBINSON Transport Company, Houston, has bought from Cummins Sales & Service, Inc., a model JBS Cummins diesel which will repower a truck; and also a model HRBB Cummins, rated at 180 hp, to repower another truck.

STANDARD Oil Company of Texas has purchased from American Bolinder-Munktell Company, Houston, two Bolinder-Munktell diesels, one each of models 1053 and 1054, for auxiliary power in an offshore service craft.

PETROLEUM Service, Inc., Dallas, will power an Oilwell model 48P high pressure pump for sand-fracturing service with a General Motors series 71 diesel.

PATSO Company, Houston, has secured a model JBS, 150 hp Cummins diesel to power an oilwell centrifugal pumping unit. Delivery was made by Cummins Sales & Service, Inc., of Houston.

Assistant General Manager

The Atlantic Manufacturing Company announces the appointment of Gasper G. Sachetta as assistant general manager. Mr. Sachetta, prior to his appointment was plant manager, diesel and gasoline generator set manufacturing and sheet metal fabrication division. Previous to joining Atlantic, he was personnel director of Price Battery Corporation for three and one half years.

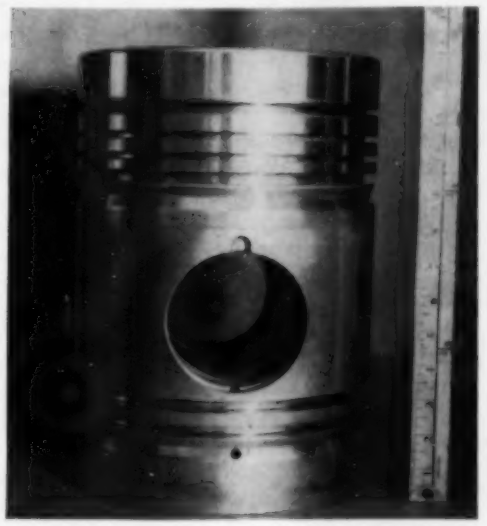
Nine Waterway Improvements Projected

Nine major projects to improve water transportation were approved by the transportation industry at the American Merchant Marine Conference and the Propeller Club of the United States Convention.

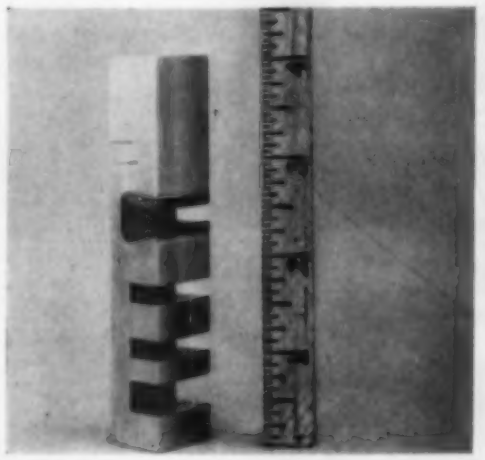
The projects are: 1. Shorten Mississippi River route from New Orleans, La. to the Gulf of Mexico. 2. Widen, straighten and deepen Chesapeake and Delaware Canal. 3. Build Trans-Florida barge canal. 4. Integrate the Mississippi-Ohio River system of inland waterways with the New York State Barge Canal and Lake Erie. 5. Build Trans-New Jersey barge canal linking the Delaware River and New York Harbor. 6. Deepen (12 feet) Atlantic Intracoastal Waterway between Cocoa and Miami, Fla. 7. Deepen harbors and connecting channels of the Great Lakes navigation system. 8. Deepen and widen the Lake Champlain waterway of the New York State Barge Canal system to improve navigation between New York City, Albany, N. Y., and the St. Lawrence River at Sorel, Quebec. 9. Deepen, widen and straighten the Calumet-Sag system of canals.

Locomotive Pistons Salvaged

IN 1949, Al-Fin, in collaboration with the American Locomotive Company, Schenectady, New York, developed a bonded bi-metallic ring carrier band of cast aluminum bonded to "Ni-Resist" for replacement use on forged aluminum diesel locomotive pistons on which the ring grooves had shown excessive wear. The original replacement ring belts were for a 9x10½-in. piston for the Alco 244 locomotive diesel engine. The cast aluminum bonded to the "Ni-Resist" ring carrier was shrunk-fitted onto the cut-back forged aluminum piston and the cast aluminum ring heliarc-welded to the piston forging around the crown of the piston to prevent oil leakage.



The Ohio Piston Company of Cleveland, Ohio, in collaboration with the Development Laboratories of the Aluminum Company of America, an Al-Fin licensee, carried on the development work and Ohio Piston Company is now offering a piston rebanding service for diesel locomotive engine aluminum pistons to American railroads. Such forged aluminum pistons, after they have passed the maximum ring groove wear-point permissible, are sent to the Ohio Piston Company. Ohio machines out the worn ring grooves and then shrinks-on a new bi-metallic ring carrier band with "Ni-Resist" upper ring carrier and heliarc-welds the cast aluminum to the forged aluminum.



Pistons, rebanded with such bonded bi-metallic ring belts using "Ni-Resist" inserts, have passed severe railroad tests and were found to be in perfect condition after continual 24-hour service day in and day out. This development helps to maintain the excellent performance and low maintenance costs on diesel-equipped American railroads. The piston forgings are of Alcoa 32ST6 and the bonded bi-metallic ring carrier belts are of Alcoa A132T-551. "Ni-Resist" No. 1A, an austenitic high-nickel cast iron, is used for the ring insert.

Arizona Distributor

Leonard W. Beck

The Min-A-Con Equipment Company, located at 1914 E. Buchanan Street in Phoenix, Arizona has been appointed distributor for the Euclid Division of General Motors to sell and service the entire line of Euclid rear dump and bottom dump units, scrapers, crawler tractors, loaders and other accessories and equipment. The new distributor will also handle the products of the Detroit Division of GM. They will cover the entire state of Arizona. A complete stock of parts are on hand to service both lines.

Heading the organization is Mr. L. W. Beck, general manager. Mr. Beck has a long background in the field having had connections with several major engine and equipment manufacturers. Mr. H. H. Hall, a mechanical engineer and construction man covers the post of sales manager. He, too, has had a varied and wide experience in the field. Mr. C. C. Sons, Jr. serves as service manager. His history makes him exceptionally well-qualified for the job he covers.

Other department heads include Mr. R. E. Zimmerman as parts manager and Mr. H. V. Schierling as office and credit manager.

Versatile Arbor Press

The Manzel Division of Frontier Industries, Inc., has introduced a 25 ton arbor press of which versatility and speed of operation are said to be the keynotes. The press features an adjustable handle and reversible and adjustable bolster or bed plates with "vee" blocks attached to one side. Bolster can be set in any of six positions by relocating two supporting pins. A bolster raising and lowering attachment with ratchet lock is optional. A two-piston hydraulic pump quickly closes the ram until the work is engaged when a single piston takes over to perform the forcing operation. A safety valve prevents accidentally exceeding the 25 ton pressure for which the press is designed.

According to the manufacturer, this press has been job tested and proven highly satisfactory on a wide variety of uses in machinery overhaul departments, automobile shops, tool rooms and laboratories. Complete information can be had by writing: Manzel, 315 Babcock Street, Buffalo 10, New York.

Reorganization

A reorganization of the Ingersoll Products Division of Borg-Warner into three separate manufacturing and sales operations and the election of J. H. Ingersoll as president and general manager of each were announced simultaneously recently. Mr. Ingersoll previously was vice president and works manager of the Ingersoll plants in Kalamazoo, Mich. As head of the Ingersoll operations J. H. Ingersoll succeeds R. S. Ingersoll, who now will devote full time to his duties as administrative vice president of Borg-Warner.

Robert F. Schutz will be responsible, as manager, for one of these new divisions, to be known as the Ingersoll Kalamazoo Division. This division, located at Kalamazoo, manufactures amphibious tanks for the U. S. Marine Corps as well as other defense products. Another unit, the Ingersoll Conditioned Air Division, also at Kalamazoo, will be under the immediate direction of F. S. Gombert as manager. This division produces and markets warm and cool air conditioning equipment and other related products.

The third unit, located in Chicago, will retain the name of the Ingersoll Products Division. This division makes diversified products, largely for the farm equipment, automotive and housing industries. R. B. Crean will serve as vice president and assistant general manager of the three Ingersoll divisions.

Announces Complete Line of Hydraulic Torque Converters

A complete line of "Torcon" torque converters for application in heavy-duty, off-the-road, vehicles as well as for stationary power plants used in construction, logging, petroleum and other fields is now being produced by Clark Equipment Company's automotive division, it was announced by C. H. King, vice president. Believed to be the broadest line of torque converters available from any single source, Torcon units are available in 11, 12, 13, 14, 15, 16, 17, 18, 19 and 26-inch wheels. Of the single stage type, the Torcon line includes rated capacities from 30 to 600 hp.

The basic package consists of a standard, mass-produced, heavy-duty torque converter that is available "off the shelf" to engine and original equipment manufacturers, as well as to operators who want to up-date equipment. Basic accessories included with the unit are a pump, cooler and pressure regulator. An important optional feature offered on the Torcon converter is a "free wheel" mounting for the stator or reaction member, according to the manufacturer. This arrangement gives the unit the combined advantages of the torque converter and fluid coupling, it is claimed. Under load, it provides the desired torque multiplication. When the load decreases, and the speed increases, the torque multiplication drops to one and the unit acts as a fluid coupling. As a result, advantage can be taken of 90% of an engine's speed-horsepower range, as compared with 75% for converters without this feature. The "free wheel" feature is recommended for equipment operating at low load and high speed for an appreciable part of the daily work cycle.

One of the outstanding characteristics claimed for the Clark torque converter units is the fact that their operating characteristics are matched to those of the engines with which they will be used.

They are designed to hold the engine within a narrow range of operating speed and torque load. As a result, engine wear and tear is kept at a minimum. The range chosen is most efficient operation-wise for both the engine and the torque converter. The torque converters have a high stall torque ratio of 3-1. For installation in a particular line of equipment, Clark will design and build the housing or case which will include the means of coupling the output of the torque converter to the input of the equipment.

For further information, write to Clark Equipment Company, Automotive Division, Falahee Road, Jackson, Michigan.

Increases Engine Hp.

Greater horsepower and faster engine speeds for the D6, D4, and D2 tractors has been announced by Caterpillar Tractor Co. This will increase travel speeds and greater power, the company says. Drawbar horsepower of the D6 has been increased from 66 to 75 and rpm from 1400 to 1600. Drawbar horsepower of the D4 has been increased from 43 to 48 and rpm from 1400 to 1600. Drawbar horsepower of the D2 has been increased from 35 to 38 and rpm from 1525 to 1650. Travel speeds of the tractors will increase according to engine speeds. Increased horsepower for these three tractors is just one of the refinements made during the past year to Caterpillar products.

Baldwin Torquemeters

Baldwin SR-4 Torquemeters and their applications are described in 12-page Bulletin 4308, issued by Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa. Eight torque pickups, 0-100 to 0-30,000 inch-pounds, and five types of instruments, including manual null balancing and automatic indicators and recorders, are described and illustrated.

Florida Diesel News

By Ed Dennis

AT New Smyrna Beach, the last 13 steam locomotives were retired early in December. They were sold for scrap iron. This makes the Florida East Coast Railway completely dieselized.

THE General Engine & Equipment Co. at Tampa supplied the two General Motors 4-51 diesels with Paragon clutches for the 43 ft. cruiser *Privateer* owned by the M. and H. Foster Associates of Tampa.

FOR St. Francis Hospital at Miami, a Caterpillar model D 364 with a Columbia 165 kw generator for standby duty from Shelley Tractor & Equipment Co., Miami.

SOLD BY Marine Motors Sales Corp. at Jacksonville, a model DH 200 Lathrop diesel rated at 187 hp for the 75 ft. Florida built dragger *Julia Da Cruz*. The new vessel will also have a 5 hp. Petter auxiliary diesel with an Onan generator plus a Maxim silencer.

Two 300 hp. Cummins diesels for the newly launched *Susabelle* by Huckins at Jacksonville. Also model HYCD Capitol hydraulic r&r gears; supplied by Cummins Diesel Engines of Florida.

THE *Cassandra* a 53 ft. yacht owned by Ward Brown of Ft. Lauderdale was powered with two General Motors 6-71 diesels also GM 2:1 hydraulic r&r gears; from Ellis Diesel Sales & Service, Lauderdale Marina.

FOR TREASURE hunting, the *Sea Rover* with a Florida type trawler hull and powered with a Caterpillar D 17000 diesel, was converted to a treasure hunting vessel by Ed Link. The Win-Power electric plant is powered by a model 4FS1-CE Nordberg diesel rated at 10 bhp.

FROM Florida Georgia Tractor Co. for Playland Homes at Hollywood, a TD#6 International Harvester dieselized tractor and Geo. Pennel received a Northwest crane powered with a 165 hp. Murphy diesel.

TO REPOWER a cab over engine job, a model NHB Cummins diesel rated at 200 hp. for Chanticleer Poultry Co. from Cummins Diesel Engines of Florida.

DIESEL BRIEFS: The *San Rafael* of the Dominican Republic with two 500 hp Fairbanks-Morse and the *Sgt. Dave Turner* powered with a 1000 hp Enterprise; 2 30 kw Hercules generating sets.

THE Miami International Boat Show, which is the third largest in size and attendance, will be held at Dinner Key Auditorium Feb. 18th thru the 23rd. Most all the marine diesel engines made in the U. S. will be on display along with many from foreign concerns.

Compressed Air Filter

A constant flow of air, free of dust and water droplets for longer periods of operation, is promised by a new mechanical filter offered by the Porous Plastic Filter Company, a Pall Filtration Company of Glen Cove, N.Y. The "Dri-Kleer" filter is the latest addition to the company's line of porous fluorocarbon plastic filter media and filters. The "heart" of the improved filter is a permanent core or "cartridge" of "Teflon" felt which is both chemically inert and water repellent. Major advantage of the 'Dri-Kleer" filter's fluorocarbon core according to the manufacturer is its water repellency which prevents accumulation of water—the major cause of clogging in other materials used. Air flow rates remain high since incoming moisture literally "rolls off" the "Teflon" fibers to collect at the base of the receptacle for simple removal. The compact filters are rated at 20 cfm flow rates, at a maximum operating pressure of 125 psi..

Appoints Director of Engineering and Research

The appointment of Dr. Franklin E. Lowance as director of Research and Engineering for Westinghouse Air Brake Company was announced by Edward O. Boshell, chairman and president of the company. In the newly created position, Dr. Lowance will direct the company's program and coordinate the research and engineering activities of all subsidiaries and divisions of Westinghouse Air Brake.

In commenting on the appointment, Mr. Boshell said, "Dr. Lowance brings to our organization a background of technical and administrative experience, which will help us utilize more fully and achieve better coordination between the existing research and engineering facilities of all of our companies. His experience in a variety of areas of engineering and physics will be a definite asset, and in particular his knowledge and experience in atomic and nuclear physics should be especially helpful because of Westinghouse Air Brake's growing interest in the Atomic Energy Program."

OGP Conference Scheduled For June

The Annual Conference of the Oil and Gas Power Division of ASME will be held in Washington, D. C., at the Statler Hotel from June 6-9, inclusive, 1955. The theme of the meeting will be "Oil and Gas Power for National Defense."

The local committee has been organized as follows: Vice Admiral Roscoe F. Good, Deputy Chief of Naval Operations,—chairman, Charles G. Cooper, Vice President Cooper-Bessemer Corporation, Washington, D. C.—vice chairman; Professor A. Wiley Sherwood, Aero Dynamics Dept., University of Maryland, College Park, Md.,—chairman, local section OGP.

P. B. Jackson, Aluminum Company of America, Cleveland, is chairman of the Meetings and Papers Committee of the OGP Division and Ray Schakel, Diamond Chain Company, Indianapolis, Indiana, is chairman of the Exhibits Committee.

The exhibits will be in the Congressional Room of the Statler Hotel. Available space permits a few more exhibitors than were possible last year at Kansas City. However, practically all of last year's exhibitors have renewed their space for the coming Conference so any new exhibitors should send in their orders with a minimum of delay.

A number of papers have been received and panel discussions are being arranged.

The first panel discussions will be on specifications by the General Technical Committee, arranged by J. C. Barnaby, Worthington Corporation, Harrison, N. J., chairman. The second panel discussion will be on the standardization of diesel engines with Captain William A. Dolen, Bureau of Ships, as chairman. Captain Carl A. Petersen and Commander Wilfred N. Howerton, both of the United States Navy Department, will read papers on the standardization of diesel engines prior to the panel discussion, and Harold V. Nutt and Harry F. King of the Navy Department will read papers on the burning of heavy fuel prior to that panel discussion.

There are no formal papers planned at the meeting on specifications by the General Technical Committee but short written discussions would be desirable. John McMillen of the Maritime Administration will read a paper on the free piston gas turbine as applied to Liberty Ships. Mr. C. A. G. Rosen of Caterpillar Tractor will read a paper and George Dashefsky, New York Navy

Yard, is arranging for two papers, one on shipboard vibration and one on noise.

Both Fairbanks-Morse and Cleveland Diesel Division have also promised papers. The former on submarine diesels and the latter on their Reynolds installation at Corpus Christi. (See DIESEL PROGRESS, October 1954 for a detailed story on the Corpus Christi installation.)

Two New Towboats

Officials of Mississippi Valley Barge Line Company, St. Louis, have disclosed details of two new towboats now under construction at Dravo Corporation's Pittsburgh shipyard for addition to the MVBL fleet. Each of the vessels is to be powered with two Nordberg Supairthermal diesel engines, having a total rating of 4200 horsepower at 514 rpm with modern Wheel Drive reverse-reduction gears. Modern in every detail, the towboats will help MVBL meet the steadily increasing demands of river traffic by handling larger barge tows at faster speeds.

Design of the vessels is based on extensive model basin tests made by Dravo at the Netherlands Testing Basin in Wageningen, Holland. The tests were conducted to obtain data that would result in the selection of hull form, propeller diameter and other factors for achieving propulsive efficiency. The towboats are to be 200 feet long, 45 feet wide and 12 feet deep. Their basic draft, with a normal load of 370 tons of diesel fuel, is 8 feet 9 inches. Provisions are made for increasing the fuel storage capacity when operations require and conditions permit. Each propeller on the vessel will be constructed of manganese bronze, with five blades and measuring 10 feet in diameter. The propellers will be enclosed in specially designed Dravo Kort nozzles of cast alloy steel. These nozzles help direct the proper flow of water to the propellers. Propeller revolutions are relatively low, 187 per minute, to gain efficiency.

The 2100-horsepower Nordberg, non-reversing marine engines will drive the propellers through oil-operated reverse-reduction gears, having a reduction ratio of 2.75 to 1. These gears also permit reversing the boat's direction without stopping the engines. An innovation in the design of the new MVBL towboats is the installation of diesel generator sets in a special compartment having sound-deadening insulation in the walls. This reduces generator engine noise. Another feature is a special sound-insulated office for the chief engineer of the boat. In this office, which overlooks the engine room, there will be installed all of the principal gages, thermometers, controls and other accessories, as well as the engine room controls necessary for operating the main engines.

The new vessels will join MVBL's fleet some time in 1955. In the MVBL fleet at present, there are 19 dieselized towboats and 4 steamboats.

New Booklet

A new picture bulletin just released by Harnischfeger Corporation, Milwaukee, carries a listing of products bearing the familiar "P&H" name. The booklet is streamlined with essential facts and capacities on P&H overhead cranes, electric and chain hoists, arc welders, welding electrodes, welding positioners, truck cranes, power shovels, electric shovels, soil stabilizers, diesel engines and also details on P&H prefabricated homes. The bulletin includes a large-size map showing locations of P&H plants, branches, warehouses and parts depots, sales offices and dealers. For a copy of this brief review of P&H products, write for Bulletin G-15, "A Great Hand to Help You Cut Costs," Harnischfeger Corporation, 4616 W. National Avenue,, Milwaukee 46, Wisconsin.

Inland River Reports

By **David I. Day**

THE Superior-powered *A. H. Truax* of the Mississippi Valley Barge Line ended her 1954 upper Mississippi season in a blaze of glory—a 16,000-ton cargo of grain and scrap-iron headed downstream looking like a lot more than her rated 1650 hp.

MRS. JASON Roberts, St. Louis, has our very sincere thanks for colored photos of the splendid *Bull Durham* of the Bull Towing Co., Joliet, Ill. This boat rates around 1200 hp., with twin Caterpillars—a product of the Nashville Bridge yards.

OUR COMPLIMENTS to Engineers Melvin Bouslog and L. E. Van Meter on the fine *Northern* seen on the upper Ohio busily shoving a lot of empties with loaded barges of pigiron, scrapiron, fluorspar, and other items. This boat is from the F. B. Walker Yards, Pascagoula, Miss., and is a fine advertisement for the Fairbanks-Morse diesel engines.

WINTER TOURISTS on the Ohio delight in finding a sternwheel towboat (not so numerous now) and were pleased at various places to see the *Union* of a Moundsville, W. Va., coal fleet. This boat is about 20 years old using a G-M engine with diesel-electric drive.

THE Kanawha Sand Company has boats now pushing gasoline on contract on the Ohio. We had our first good look at the bright new *Cap'n Bill Stump*, built at the Hillman yards. She uses General Motors engines and is some 75 feet in length.

CAPT. PAUL RUTTENCUTTER was doing a very neat job of piloting the *Cornell* of the Union Barge Line, a Dravo-built worker of renown. She had a nice fleet of barges, acids, steel, and empties. She has evidently more than her rated 2800 hp from her twin Superiors.

WE FAILED to see the *Jeffboat*, the 3000-hp Fairbanks-Morse powered boat, pride of the American Barge Line fleet but C. M. Markle of near Cincinnati did evidently as he had a neat picture of the boat headed upriver; Later she came down with 11 barges of steel.

DRAVO Corporation has under construction two towboats, 200x45x12 in dimensions for the Mississippi Valley Barge Line, St. Louis. The boats not yet named will use two Nordberg engines each to generate 4200 hp at 514 rpm. This will give the MVBL fleet a total of 23 diesel vessels.

NOTING the *Anker L. Christy* stopping at Memphis recently we were reminded that the man for whom the vessel was named is retiring from his years of labor with the Pure Oil Company. This boat has been a wonder on the waterways, taking in stride all sorts of weather since 1941. She was built by Sturgeon Bay yards and has always been owned by Pure Oil. She uses Cooper-Bessemer engines rated at 1200 hp.

WE HAVE a recent picture of the *Ernest T. Weir* passing down the Mississippi with 13 barges of grain and scrap-iron. She is Dravo-built and came out about the same time as the *Christy*. She uses Superior engines, 1300 hp.

THREE LETTERS came this month mentioning the favorable impression made on rivermen around Pittsburgh and on the Monongahela River by the *Patsy Chotin*, a 2000 hp, G-M powered craft, Nashville-built of the Chotin fleet of New Orleans. We noted the boat more recently on the lower Ohio, resplendent in red and white paint, with green awnings. The boat is a very smooth runner in rough water of the winter season.

NOW THAT the upper Mississippi is ice-bound, the Coast Guard Cutters, *Lantana*, *Popular*, and *Fern* are much

in evidence on regular chores and in breaking ice. In response to a query by Mrs. Leonard Ripley, Chicago, we can say all are triple-engines, the *Lantana* using three Murphy engines, the other two using three Fairbanks-Morse engines each.

ALSO IN response to a question answered by mail we can say that the *George Stevens* of the MVBL fleet is an old one on the job since 1939 and uses an Atlas Imperial engine. She was originally in the fleet of the Kosmos Towing Co., Louisville, Kentucky, and was called the *Keeneland*.

Increases Production

Ralph R. Layte, President of Purolator Products, Inc., of Rahway, N. J., pioneer manufacturer of oil filters and other types of filtration equipment, announced that his company increased production this year with the opening of a new factory in January at Allentown, Pa. At the new plant in Allentown, Pa., Purolator manufactures its multiple-element line of bulk filters which are specifically designed for dependable and efficient full flow filtration of hydrocarbons, such as gasoline, kerosene, jet and distillate fuel oils.

Decision to open up a second factory in Pennsylvania, the first having been started in 1951 at Ringtown, Pa., was reached because of increased orders for Purolator oil filters and elements, Mr. Layte said. The new facilities gives Purolator 40,000 square feet under cover, plus a large erecting yard.

In addition to its three American factories at Rahway, N. J., Ringtown, Pa. and Allentown, Pa., Purolator Products, Inc., will continue to operate central sales headquarters in Detroit, Chicago, and Los Angeles. The Canadian subsidiary, Purolator Products (Canada) Limited, occupies a new plant in Toronto, Ontario, and Purolator filters are also manufactured under license in Great Britain, West Germany, France, Italy, Australia, and Brazil.

Opens RR Diesel Shop

The opening of Great Northern Railway's largest diesel shop west of the Rocky Mountains touched off a two-day community celebration at Spokane, Washington recently. The new Hillyard diesel shop, part of a $675,000 modernization program there, rose almost literally from dust of the steam locomotive shop which was constructed in 1912 and made railroad history in 1927-30.

Replacing the old steam locomotive pits are four depressed tracks of 155-pound rail, carried above floor level on pedestals and served by raised concrete and steel platforms, facilitating work at three levels. Another three tracks lead to a 16-foot pit where a 100-ton drop table permits the replacement of diesel locomotive trucks in a matter of two hours or less. Adjacent to the diesel shop, and under the same roof, is the machine shop, where modern equipment has kept pace with the transition from steam to diesel-electric operation. The Great Northern is now completely dieselized west of Minot, N. D., with heavy maintenance and overhaul facilities for its western lines at both Havre, Mont., and Hillyard.

Named to New A-C Posts

The appointment of G. V. Woody as special assistant to C. W. Schweers, vice president, director of sales, general machinery division, Allis-Chalmers Mfg. Co., was announced recently by J. L. Singleton, vice president in charge of the division. Previously, Mr. Woody was manager of the firm's processing machinery department, a post he has held since 1945. Mr. Singleton also announced that William M. Wallace would succeed Mr. Woody as manager of the processing machinery department. Mr. Woody came to Allis-Chalmers in 1909 after graduating as an electrical engineer from Rose Polytechnic Institute.

Inland Waterways Construction, 1954

By David I. Day

WE cannot rate 1954 sensational in the matter of boat-and-barge construction on the Mississippi River and tributaries. Nor can we make serious complaint. Work was fairly steady, rather evenly distributed, making for good peace-time production. Early in the year, we noted the ferry boat *Shiela* under construction with a 113 hp. GM engine. A little later on, Green River, a stream to be given new locks and dams, gave a portent of things to come in the neat appearance and fine pushing power of the brand-new *Trailblazer*. This boat was built at the yards of the Barbour Metal Boat Works at Lemay, near St. Louis, Mo. to push coal barges for the Paradise Collieries. She is over 50 ft. long and uses twin Cummins diesel engines rated at 380 hp.

About the same time we looked at the STI-2195, built by Nashville Bridge for the U. S. Army. This craft has been of unusual interest to rivermen because she draws only about 2½ ft. of water and the hull above waterline is not over 8 ft. The boat uses twin Caterpillars, totaling 510 hp. We were surprised to find three rather than two engines. The Tennessee Valley Authority started its new *Lucy E* to work in February. She came from St. Louis Ship with twin GM diesels giving 410 hp. On our March trip south, we found the big 210x40x 15 floating machine shop completed at Alexander Shipyard, New Orleans, for the U. S. Army.

Upon our return to Cairo, we learned the new *Philip Sporn* had been completed at Barbour yards and had set to work for the Ohio Power Co. She has twin GM engines totaling 270 hp. The *A. H. Crane* was launched at St. Louis Ship for service with the Ohio River Co., using twin Baldwin-Lima-Hamilton engines. Two Caterpillar-powered towboats set to work also—The *Jocaljim* for upper river work on the Mississippi, and the *James P. Pearson*, for Moline sand and gravel people. The former is a product of St. Louis Ship, the latter of the Maxon yards at Tell City, Ind.

Everyone was pleased with the work of the first of several "ram boats" designed especially for sand and gravel towing as they came forth from Dravo yards. First off the ways was the *Nancy Jane* and next the *Cap'n Joe*, both using Atlas 35 engines, 580 hp. A similarly powered and more widely heralded boat, the *Cap'n Bill Stump* was launched at Hillman's at Brownsville, Pa. We noted an increasing number of barges under construction at Brownsville.

Our compliments to the U. S. Engineers at Memphis on the appearance and efficiency of their new Alexander-built patrol boat *Sullivan*, using 580 hp. Superiors. At the southern yards the amount of work being done for the oil and sulphur industries was most impressive. The yards of the Jeffersonville Boat & Machine Co., Jeffersonville, Ind., revealed in August a wide variety of jobs. This situation was fairly typical of all the larger and more important river construction centers. The yards had just launched Jeffboat Hull No. 500 for the Material Service Corp., Chicago. They also were

Note the *Trailblazer*, a Barbour-built boat using twin Cummins diesel engines usually pushing coal on Green River for Paradise Collieries. Here pushing a derrick barge and a landing barge built by Jeffersonville Boat & Machine Co., for Kentucky Utilities Corp.

building barges and other equipment for Blaske, Midcontinent, Southland Towing Co., Pike Grain Co. Aiple Towing Co., Traylor Bros., the Indiana-Kentucky Electric Corp., the Ohio Valley Electric Corp., the Kentucky Utilities Co., the American Barge Line and others.

As the summer waned, Maxon built a new ferry barge for the nearby Cannelton-Hawesville ferry, the A. L. Mechling Barge Line, Joliet, Ill., received from the Calumet Shipyard, Chicago, its new tug, the *Sharon Lee* and took it to Tampa, Fla., establishing a Great Lakes to Tampa water freighting connection. It looked like every port visited had plans for new docks, repaired docks, mooring facilities, terminal warehouses, and other structures to facilitate further a growing river freight business. At every boat yard, one or more towboats were being overhauled or repaired.

At the Barbour yards, Lemay, Mo., many were inspecting the *Clifty Creek* and the *Yankeetown*. The former is owned by the Indiana-Kentucky Electric Corp., the latter by Mid-Continent Barge Line. Both are powered by GM diesels, and will be in the Ohio River coal trade.

October along the inland rivers was never lovelier than in 1954. On the upper Mississippi, the Coast Guard started the discontinuance of navigation lights and there were other signs of the closing of the channel. Everywhere, rivermen were comparing and contrasting the year with previous years. In New Orleans, Higgins shipyard was working on the ninth of 10 minesweepers. Everything was being geared to the early freezing of the upper Mississippi River.

As an indication of future river freight service on the Missouri, the Federal Barge Lines announced the early construction of a new 3600-hp. Missouri River towboat, the *Lachlan Macleay* by the St. Louis Shipyards. The same shipyard completed the conversion to diesel (General Motors, Cleveland) of the tanker *Martha E. Allen*, owned by Lake Tankers. Painting and repairing of the Upper Mississippi dams and locks continued, closing to navigation December 6.

It is impossible, of course, in a brief article to mention all the construction activities on hundreds of miles of busy rivers. We have merely mentioned here the work we saw, believing it to be a good indication of what took place last year.

To Buy J. D. Adams Company

Merle R. Yontz, president of LeTourneau-Westinghouse Company, announced recently that LeTourneau-Westinghouse has entered into an agreement to purchase the plant and assets of J. D. Adams Manufacturing Company of Indianapolis, Indiana. Adams, a pioneer manufacturer of roadbuilding and earthmoving equipment, has been in business since 1885. The Adams line consists of well known and widely accepted motorgraders and traveloaders used extensively in the roadbuilding and road maintenance fields. The purchase includes inventories, receivables and approximately 500,000 square feet of completely equipped plant and manufacturing facilities in Indianapolis and Canada. Total consideration was not disclosed. The transaction is subject to the approval of the Adams Company shareholders, and the adjustment of certain legal and technical matters.

Yontz stated that LeTourneau-Westinghouse, in the year and one-half since its organization, has been working toward providing its many customers around the world with an improved product line as well as a more complete earthmoving "package". The addition of the Adams line is another step toward that objective. LeTourneau-Westinghouse is a wholly owned subsidiary of Westinghouse Air Brake Company. It was established in May, 1953 when Air Brake purchased the earthmoving equipment business of R. G. LeTourneau, Inc. as part of its diversification program.

Adams products will continue to be produced in Indianapolis and Canada, with the plants there to be known as the Adams Division of LeTourneau-Westinghouse Company. Present personnel of the Adams Company will continue to operate the newly acquired facilities, bringing their many years of experience with them. This increases the number of plants operated by LeTourneau-Westinghouse to six, the other plants being situated in Peoria, Ill.; in Toccoa, Georgia; in Sydney, Australia; and in Campinas, Brazil. There will be no immediate changes in the distribution, production and managerial policies of the Adams division

Howard R. Meeker, currently president of Adams, will be chairman of the board of LeTourneau-Westinghouse Company. Merle Yontz continues as president. Floyd D. Wallace, vice president of Adams, will become a vice president and director of LeTourneau-Westinghouse and will be general manager in charge of manufacturing operations in Indianapolis. Other key personnel of Adams to be associated with LeTourneau-Westinghouse are W. W. White who will serve as a consultant and Morris L. Brown who will be a director and assistant secretary.

Acquires Exclusive Sales Representation

The United States Hoffman Machinery Corporation, 105 Fourth Avenue, New York, has acquired the exclusive worldwide sales representation for all Hygrade Atlas Inc., products, according to an announcement made public by Revis L. Stephenson, vice-president in charge of Hoffman's Industrial Equipment Division, and Anthony P. Bambara, president of Hygrade Atlas, Simpson, Pennsylvania. The new Hoffman enterprise will be known as the Hygrade Metal Finishing Division. The contract will further expand the U.S. Hoffman line of heavy machinery equipment.

According to the statement, the arrangement was completed in line with the previously announced aims of strengthening the industrial operations of U.S. Hoffman, with an eye toward an expanded sales program of industrial products. It is part of the over-all expansion plan for the Hoffman corporation outlined earlier in the year by Hyman Marcus, president of the multi-million dollar concern. With the consumation of this contract, the U.S. Hoffman Corporation is now in a position to offer a new line of products allied with, and complementary to, the equipment now manufactured through Hoffman's Industrial Equipment Division. Included in the new line are metal-cleaning, rust-proofing and paint-bonding equipment, as well as drying ovens, electrostatic painting equipment, paint spray booths and paint baking ovens.

All inquiries concerning the new Hygrade Metal Finishing Division should be addressed to the U.S. Hoffman Machinery Corporation, 105 Fourth Avenue, New York, N.Y. In Canada, contact Canadian Hoffman Machinery Co., Ltd., Charles Street, Newmarket, Ontario.

Powerful Haul

This generator stator is believed to be the heaviest single piece ever to be moved by truck over a California highway. Built by the General Electric Company, it weighs 228 tons. It was shipped to California on a specially built railroad flat-car. It had to be moved a distance of 9.3 miles from the railroad siding at Camp San Luis Obispo to Morro Bay. The Belyea Truck Company was awarded the contract to transport the stator over the highway. The equipment used was a combination Sterling tractor powered by a Cummins diesel engine, a Fruehauf 7-axle lowbed trailer and a dolly assembly having a total of 82 wheels. The total weight of the load and carrying equipment was approximately 310 tons.

Because of the tremendous weight, it was necessary to lay 3 in. x 12 in. planking on the highway for the entire distance. It was also necessary to construct a mat of 14 in. x 14 in. timbers over each of the nine bridges and culverts. In addition to the Cummins powered Sterling tractor, three additional tractors with heavy winches were used to pull the load up two hills.

Special Representative

C. Clark Kenlan

C. Clark Kenlan, who has been associated with the industrial generator set business and the electrical equipment business for a number of years, has been appointed a special representative of the Engine Division of The National Supply Company with headquarters at Springfield, Ohio. He will be responsible for coordination and development of small engine sales to industrial accounts and through dealers. He was in the New York sales office of Crocker Wheeler Manufacturing Company for five years and was chief engineer of the Electric Arc Company, Newark, N. J., for two years. He has also directed his own engineering firm. He is a graduate of Rutgers University with a degree in electrical engineering.

General Manager Appointed

Russell C. Pond

The appointment of Russell C. Pond as general manager of Auto Marine Engineers Inc. of Miami was announced by Plato Cox, president of the firm. Mr. Pond was formerly connected with Oliver H. Van Horn at Houston Tex. and International Harvester Co. at Memphis Tenn. During WW II he was supervisor of production control at Higgins Aircraft Inc. in New Orleans. Auto Marine Engineers Inc. are the distributors for Hercules marine diesel engines for South Florida and the Bahamas.

Delivers Venezuelan Tug

Equitable Equipment Co., Inc., has just delivered another of its "Equity" Standards to a prominent South American firm. This time its an "Equity" 66 ft. steel diesel tug. It was delivered to the C. A. Maritima Falcon of Caracas, Venezuela. This tug was delivered in the remarkable time of 70 days after placement of order. Delivery was taken by Mr. Felipe Silen, the president and Dr. Victor Brito, a director of the Venezuelan firm, at Equitable's Shipyard in Madisonville, La.

The dimensions of the *Las Morochas*, an "Equity" standard 66 ft. all steel tug are: length overall 66 ft.; beam molded 17 ft.; depth molded 8 ft.; its approximate draft is 6 ft. 9 in. It contains the following facilities: pilothouse, upper quarters, main desk quarters, galley, engine room, fuel tanks, water tanks, forepeak and afterpeak. The main engine is an Enterprise model DMM-362 which is rated at 400 hp. at 800 rpm. The speed of the tug is approximately 11-12 mph. It was built in accordance with the American Bureau of Shipping's standards for river and harbor towing service. It will be used for this type of service on the Orinoco River in Venezuela in oil and iron ore operations. Captain V. Fuentes was in New Orleans and will take the *Los Morochas* down to Venezuela under its own power.

REA Plant Managers Annual Meeting

Final plans for the annual meeting of REA plant managers in Denver, Colo., May 2 to 5, inclusive, have been announced by Harry F. Collins, Pittsfield, Ill., the general chairman. Convention headquarters will be the Shirley-Savoy hotel. Mr. Collins urges all who plan to attend to make their reservations before April 25.

The DIESEL PROGRESS Efficiency Plaque is awarded to the manager of the diesel generating plant "most efficiently operated of all REA internal combustion plants." The presentation to that plant's manager will be made by Rex W. Wadman, Publisher and Editor of DIESEL PROGRESS, who originated the idea in 1951. The brief ceremony is scheduled for the first afternoon session of Monday, May 2, with Gus Hemholz, of the REA staff, presiding as chairman.

The Wolverine Electric Cooperative, Hersey, Mich., won the Efficiency Plaque the last two years but is not eligible this year because of a ruling that a winner in two consecutive years must drop out of the competition for one year.

The conference committee consists of the following: Chairman—Harry F. Collins, Asst. Mgr., Illinois Rural Electric Co., P.O. Box 186, Pittsfield, Illinois; Southern Diesel Member—Clyde R. Price, Chief Engr., Lea County Electric Co-op, Inc., P.O. Box 98, Lovington, N. M.; Southern Steam Member—Charles H. Wolf, Chief Engr., Western Farmers Electric Co-op, Anadarko, Okla.; Northern Diesel Member—Victor Hanson, Manager, Western Minnesota Power Co-op, Benson, Minn.; Northern Steam Member—Lloyd V. Hillier, Plant Supt., Minnkota Power Co-op, Grand Forks, N. D.; REA Representative Member—W. E. Rushlow, REA, Washington, D. C.; Denver Area Member—L. G. Stukey, Mgr., Yampa Valley Electric Assn. Inc., Steamboat Springs, Colo.

Sales Engineers

R. A. McCloskey

D. C. Vick

Two sales engineers for the Engine Division of The National Supply Co. have been assigned to new territories. D. C. Vick, who formerly made his headquarters at Springfield, Ohio, has been transferred to Lincoln, Nebraska, assisting J. A. Dye, and will cover Nebraska, Kansas, and parts of other midwestern states. R. A. McCloskey, who formerly worked with Mr. Vick in covering Ohio, Indiana, Illinois, and Michigan, is now working in Ohio, Kentucky, West Virginia, and the southern part of Indiana, while National Supply's engine distributor, R. B. Richardson Company, takes charge of Michigan territory. Mr. McCloskey will make his headquarters at Springfield, Ohio.

Regional Managers

H. A. Strohman

M. W. Brooks

Cummins Engine Company has announced appointment of two regional managers. H. A. Strohman, assistant regional manager, eastern region has been transferred from his previous headquarters location in New York City to the new middle-Atlantic office of Cummins Engine Company, Inc., at Harrisburg, Pennsylvania. Mr. Strohman will now make his headquarters in the Hall Building, Second and Locust Streets in Harrisburg. He will act as Cummins representative in Pennsylvania, Maryland, Delaware, Southern New Jersey, the Western third of New York State, and a portion of Northern Virginia.

M. W. Brooks assumes the position of regional manager, mid-west district—central region, with headquarters at 707 Shell Building, 1221 Locust Street, St. Louis 3, Missouri. Mr. Brooks will serve as Cummins representative in the Kentucky, Southern Illinois, Missouri, Iowa, Northern Kansas, Nebraska and South Dakota areas. Until recently Mr. Brooks headed the Industrial Power Division of White Motor Company, and previous to that he was Cummins regional manager—Great Lakes region at Cleveland.

Increased Sales Speed Building Program

The completion of another new plant addition was recently announced by The Trane Company, La Crosse, Wisconsin, to facilitate the fabrication and distribution of its consistently expanding air conditioning and refrigeration lines. According to works manager E. E. Hallander, this additional production area is needed primarily to permit a more integrated, production line operation on the former which includes remote air conditioning units and unit ventilators, sales of which have increased greatly in the past year. In the wake of this announcement, Trane president D. C. Minard said in an address to the New York Society of Security Analysts on October 18, 1954, that between 1946 and 1953, Trane sales have increased 229 per cent to $45,500,000. He said that 1954 sales should hit $50,000,000, or about 260 per cent more than the 1946 figures. These figures are indicative of the reasons why the company has been expanding its production areas.

Develops New Tank Gauge

The Liquidvision Gauge & Control Corp. of Baldwin, Long Island, announces the development of a tank gauge known as Magnalux. This is an improved type of automatic reading gauge to show the height of any liquid including liquefied gases that are stored under pressure. One of the outstanding features of this gauge is that it can be used on existing tanks without the necessity of cutting holes or other openings in the tank itself. It is an externally connected instrument that is simple to install and can be quickly and easily placed on existing tanks.

Magnalux consists of a non-magnetic column that is connected to the liquid and vapor space of the tank. Within this column a float is free to rise and fall. As the liquid in the tank changes in level, the liquid flows through a connecting tube to the column and levels out in the column itself. The float, which has a magnet connected to it, follows this change in level and the field from the magnet positions a roller on the outside of the non-magnetic column. The indicating roller is enclosed within a plastic raceway that is filled with an inert gas. On each side of the raceway are placed scales that can be graduated in feet and inches, gallons, or any other convenient unit of liquid measure. Thus the operator can see at a glance the exact amount of liquid stored within the tank.

Another outstanding advantage of this gauge is that there is no possibility of either liquid or vapor escaping from the tank as the tank seal is a solid metal wall of non-magnetic metal and this wall can be made as thick as required for any pressure. It is entirely self-actuated and does not depend on any outside source of power for its operation. Neither is it necessary for the operator or attendant to manipulate valves or any other mechanism. By simply noting the position of the roller on the scale, he knows instantly the exact amount of liquid on hand at all times.

This gauge can be furnished with switches to actuate audible or visible alarms or to control pumps or valves. Magnalux is now available and further information can be obtained by writing the Liquidvision Gauge & Control Corp., P.O. Box 51, Oceanside, Long Island, New York.

Moves to Larger Quarters

Daros American Corporation is moving to new and enlarged quarters February 15th. In order to provide for larger warehouse and service facilities, Daros is moving into a new building located at 8128 North Lawndale Ave., Skokie, (suburb of Chicago) , Illinois.

Deceased

Ernest Kuehn

Ernest Kuehn, 69, one of the pioneers in the development, manufacture and application of the gasoline electric rail car and of the diesel locomotive, died in Indio, California, of a heart attack, late last year. Mr. Kuehn was born May 28, 1885 in St Louis, Mo. He supervised the manufacture of hundreds of the gasoline electric rail cars which Electro-Motive put on United States railways between 1924 and 1932. He remained the key figure in the manufacturing set-up of Electro-Motive when the transition from the gasoline-electric rail car to the diesel locomotive began in 1933. Electro-Motive had become a part of General Motors in 1930 and in 1933 had been asked by the Burlington Railroad to design and supply the power plant for the Pioneer Zephyr, America's first dieselized streamlined train. He personally supervised the installation of the General Motors diesel engine in this train, and participated in the early run.

Mr. Kuehn's name is involved in many of the legends of the earliest days of the diesel locomotive. He was one of the three operators of the Pioneer Zephyr on its Dawn to Dusk run from Denver to Chicago to open the second year of the Chicago Century of Progress Exposition in 1934.

Opens Spanish Plant

A new plant was recently opened in Madrid by Worthington Corporation's Spanish associated company, Bombas y Construcciones Mechanicas Worthington, S. A. The plant will produce a wide variety of Worthington pumps ranging from feed pumps for locomotives to deep well and vacuum pumps, as well as diesel engines and steam turbines. Accompanied by Worthington representatives, the officials also toured the plant offices housed in a separate building which is air conditioned by Worthington equipment made in Spain.

Worthington Corporation, which produces a wide range of machinery and equipment for industry, public works and the home in fifteen plants in the U. S. A. and twelve in foreign countries, opened its first office in Spain in 1915 in Madrid near the Royal Theater.

ADVERTISERS' INDEX

SUPER COOLER FOR THE SUPER CHIEF!

Point of departure: Chicago. Destination: Los Angeles. Time: 39½ hours. Speed: up to 100 miles per hour. A hot, gruelling run on a split-second schedule, but Santa Fe's ultra-modern Super Chief takes it in cool stride. For Harrison lube oil and water jacket coolers are on the job keeping Diesel Engine temperatures under control. In fact, chances are the crack streamliner you ride today depends on Harrison heat exchanger equipment for efficient, reliable cooling. If you have a cooling problem, look to Harrison for the answer!

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N. Y.

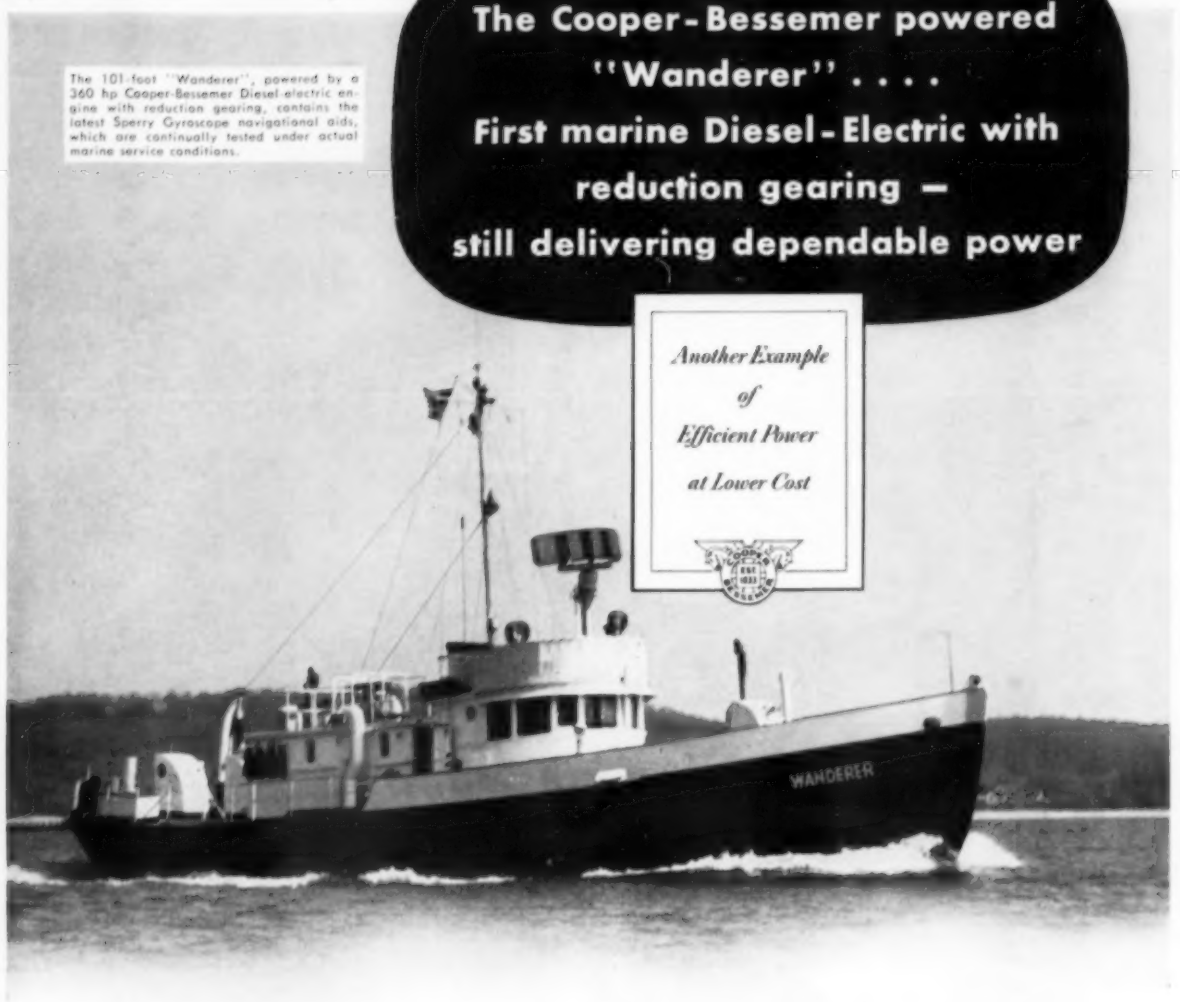
HARRISON

TEMPERATURES MADE TO ORDER

The Cooper-Bessemer powered "Wanderer" . . . . First marine Diesel-Electric with reduction gearing — still delivering dependable power

The 101-foot "Wanderer", powered by a 360 hp Cooper-Bessemer Diesel-electric engine with reduction gearing, contains the latest Sperry Gyroscope navigational aids, which are continually tested under actual marine service conditions.

Another Example of Efficient Power at Lower Cost



SINCE 1936, the M/V "Wanderer's" 8-cylinder Cooper-Bessemer engine has delivered dependable power over a wide range of heavy-duty demands. As one of the first Diesel-Electric marine vessels employing a high speed electric motor and reduction gearing, the "Wanderer" has proven its adaptability in services from private yacht, to Atlantic patrol duty, to experimentation and testing.

Now in continuous operation as a floating laboratory for the Sperry Gyroscope Company, the Wanderer's" operation is one more example of trouble-free Cooper-Bessemer power in vessels of every type—luxurious yachts, rugged fishing schooners, large towboats, busy tugs, river ferryboats and ocean-going cargo vessels . . . wherever reliability is important.

Stamina, availability, smooth operation, low maintenance, economy . . . *all* are a part of the Cooper-Bessemer performance story. If your plans call for an engine between 200 and 5000 hp, remember Cooper-Bessemer.

MOUNT VERNON, OHIO
COOPER-BESSEMER
GROVE CITY, PENNA.

New York, N. Y. • Washington, D. C. • Gloucester, Mass.
San Francisco, Calif. • Houston, Texas • Seattle, Wash.
Los Angeles, Calif. • Chicago, Illinois • St. Louis, Mo.
Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia
San Diego, Calif. • New Orleans, Louisiana

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS